INDUSTRIAL REFRIGERATION

BUYERS' DIRECTORY ISSUE

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Now-
Trade In!
Trade Up!

Up to 24 months to pay on Gifford-Wood's famous Type CA cuber

GET THIS NEW 26,000-AN-HOUR CUBER WITH G-W'S GREAT NEW TRADE-IN DEAL!

Here's a top deal that can increase your ice cube volume overnight! Think of the extra business you'll handle... the reduced labor and handling costs you'll have... and the years of trouble-free service you'll get with a new Gifford-Wood Cuber in your plant.

And the best news is G-W's generous trade-in offer! Turn in your old G-W Cuber—it serves as your down payment. Then take up to 24 months to pay with G-W's new and easy Pay-Way Plan! You're earning big profits while your G-W pays for itself by turning out up to 26,000 perfect ice cubes an hour.

G-W's Type CA Cuber is specially designed to eliminate ice waste. As soon as the first cake is ¾ cut, the second cake slides easily into place, pushing the remaining quarter into the saws. And every part of the cuber that touches the ice is not only sturdy, but completely corrosion-proof. Maintenance costs are rock bottom.

Write today for a Bulletin which fully describes this advanced Type CA... and let a G-W representative tell you just how much you'll get when you trade in your old G-W Cuber. (You'll be pleasantly surprised!) And if you're just coming into the market for a large-volume cuber, why not find out how a low-cost, *completely reconditioned* G-W Cuber can build up business—*fast!* For even if you don't have a cuber to trade, you may wish to take advantage of G-W's terms!

1021

GIFFORD-WOOD CO.
Hudson, N. Y.

New York 17
420 Lexington Avenue

St. Louis 1
Railway Exchange Bldg.

Chicago 6
565 W. Washington St.

Pacific Coast Representative:
Western Ice Equip. Co., 420 Market St., San Francisco 11

Scorers, Breaker-Elevators, Conveyors, Breakers, Tools and all types of ice handling equipment.

GIFFORD-WOOD CO., Hudson, N. Y.

☐ Send me your Bulletin on G-W Cubers.
☐ Ask a G-W Representative to call with full information on your proposal at no obligation to me, of course.

Name_____

Address_____

City_____ Zone____ State_____

VESTIBULE TYPE TRACK DOOR

YEARS OF SATISFACTION

"Butcher Boy"

Quality Since 1885

WHY "BUTCHER BOY" DOORS ARE THE FINEST REFRIGERATOR DOORS BUILT!

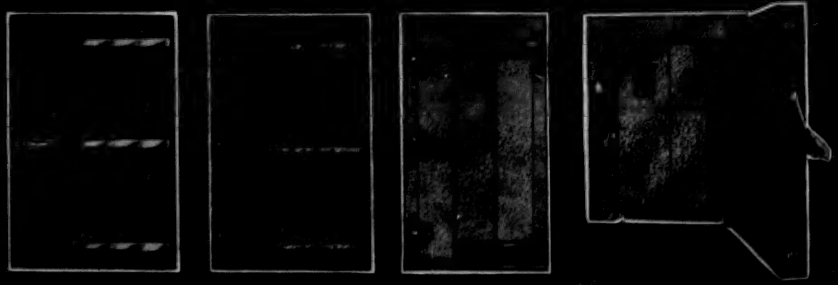
These Exclusive Features Furnished At No Extra Cost

DOOR STRUCTURE

HARDWARE

APPEARANCE

When a Man Thinks Twice ...He Makes Comparisons

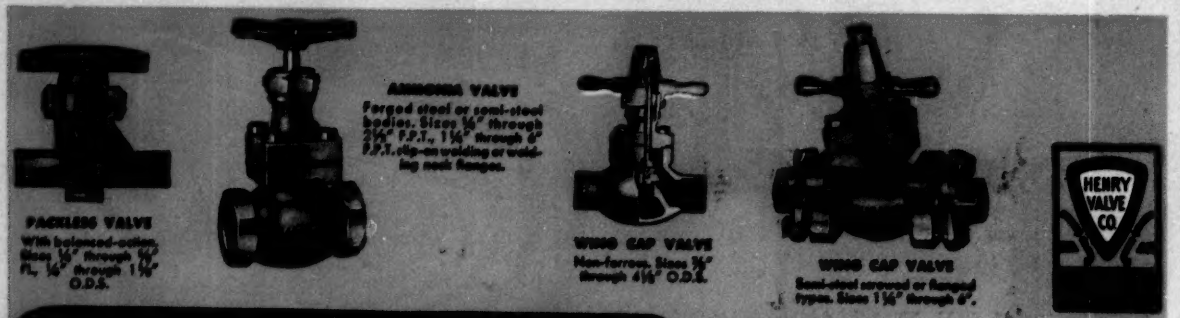


COOLER FREEZER

LOW TEMPERATURE

SUPER FREEZER OVERLAP

BUTCHER BOY REFRIGERATOR DOOR CO. HARVARD, ILLINOIS



PACKLESS VALVE
With balanced-action. Sizes ¼" through 6" FL, ¼" through 1¼" O.D.S.

AMMONIA VALVE
Forged steel or semi-steel bodies. Sizes ⅜" through 2½" F.P.T., 1¼" through 6" F.P.T. slip-on welding or welding neck flanges.

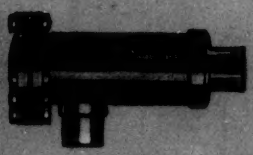
WING CAP VALVE
Non-ferrous. Sizes ⅜" through 4⅛" O.D.S.

WING CAP VALVE
Semi-steel screwed or flanged types. Sizes 1¼" through 6".

HENRY VALVE CO.

no premium for..

Henry products



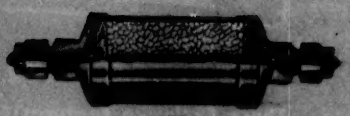
STRAINER
Angle type with patented distortion-type flange. Sizes ⅜" through 4⅛" O.D.S., 2½" through 6" butt weld.

Y-STRAINER
Brass plated. Welded steel construction. Forged brass connections. Sizes ⅜" through 4⅛" O.D.S., 2½" through 6" butt weld.

BALANCED-ACTION PACKLESS LIQUID LEVEL GAUGES
Valves are backseating—diaphragms may be inspected or replaced without loss of liquid. Conforms with all safety code requirements. Also packed types, capped or with hand wheels.

CHECK VALVE
Piston Type For Freon. Sizes ⅜" through 4⅛" O.D.S.

DRIER
Cartridge type 12 to 500 cu. in. capacity. Sizes ⅜" to 2⅛" O.D.S



DRIER
Large diameter and capacity. All brass construction. Minimum pressure drop.

... Write for these catalogs

No. 101 Packless and packed valves, strainers, driers, check valves, relief valves, three-way valves, liquid gauge sets, flange unions and accessories for air conditioning, refrigeration and industrial uses.

No. 201 Ammonia valves and accessories.

No. 71 Drop forged and cold rolled steel fittings.

DIAPHRAGM RELIEF VALVE
Operates independently of outlet pressure permitting use of rupture disc assembly on outlet side without increasing initial lock pressure. Forged brass bodies. Sizes ¾" & 1¼" I.P.S., ⅝" & 1⅛" O.D.T.

UV NB

STRAIGHT-THROUGH RELIEF VALVE
Large capacity—All brass construction. Sizes ½" through 1" P.T. Meet A.S.M.E. standards, National Board Certified. Other sizes and types available.

Stocked and Sold by Leading Jobbers

HENRY VALVE COMPANY

STAND-OUT

Frozen Foods Show Steady Gains

THE melting of sales resistance to frozen foods gained momentum during the hot summer.

Frozen-food retailers report that sales during July and August were much higher than a year ago and credit the increase in volume to these developments:

Constantly improving production and distribution methods that have brought prices of frozen products down to a better competitive position with canned and fresh foods.

The increasing number of frozen "ready-to-serve" or "heat-and-eat" items.

Recent experience has revised the industry's sales predictions for the year. Some in the trade expect a rise of at least 15 per cent from last year. In recent years, the rate of gain has run about 10 per cent.

Heat-and-Serve Boom

All indications are that prepared meals offer the greatest potential. Although such products cost more than the ingredients alone, they are in heavy demand because of the time they save the housewife. Last year, for example, more than $151,040,000 was spent in combination grocery stores for such products, according to a survey by the Topics Publishing Company. This is an increase of 68.5 per cent over 1953.

Another study indicated that cooked frozen foods now represented 25 per cent of distributor volume. Asked to predict the volume two years from now, the distributors said they expected the level then to be 37.3 per cent.

That this prediction can easily become an actuality is apparent from studies of case histories in the Nielsen Food-Drug Index records. These have proved time and time again that an important percentage of consumers will pay a higher price for a quality product. When quality is combined with convenience the potential market is generally enlarged.

A factor favoring an increase in the sale of all frozen foods is the growing list of stores handling such products. In earlier years most of the frozen food business was done by chains and large independents. At present, however, about 89 per cent of medium-size independent stores sell frozen food, while about 65 per cent of even the smallest independents handle some frozen items.

Industrial Refrigeration

formerly ICE AND REFRIGERATION
Now in its 64th Year of Publication
J. F. NICKERSON, FOUNDER

Vol. 129 October, 1955 Number 4

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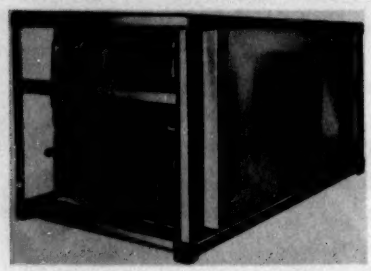
What's New

MACHINERY
APPLIANCES • PROCESSES

New Ice Bank Machine For Air Conditioning

A NEW line of ice banks for chilled water application in air conditioning is announced by the King Zeero Company, Chicago, Ill., with capacity of 500 to 30,000 pounds ice storage in a single unit. Over 500,000 Btu are available in one unit with 45 F water design temperature. There are 94 sizes to fit space requirements, and other designs for special applications.



The New King Zeero Ice Bank.

Large water compartments are spaced on 11 and 12 inch centers. Thirteen percent extra ice capacity can be safely attained with up to 300 gals per min water flow, having directed course of water with built-in agitation. The ice thickness is controlled automatically, eliminating freeze ups.

New Trane Centravac

TRANE CenTraVacs are now available with refrigeration capacity up to 800 tons, doubling the largest previous capacity. The photo below shows the large water chiller on test in Trane's "House of Weather Magic" laboratory in La Crosse, Wisconsin. Powered by a 600-horsepower squirrel-cage motor, the world's largest hermetically-sealed motor, the new unit has demonstrated even higher efficiency than CenTraVacs available up to now. The main features of hermetic seal, economical part load operation down to 10 percent, automatic operation, freedom from vibration and long life it is claimed, are retained in these new packaged refrigeration units.

The New Trane Centravac

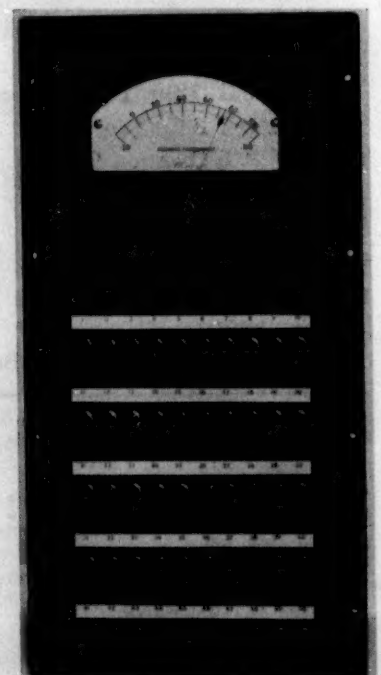
New All Plastic Refrigerated Trailer

A NEW plastic refrigerated trailer was unveiled May 4 at the Davidson Transfer & Storage Co. Terminal at 6201 Pulaski Highway, Baltimore, Md. It was built by the Strick Company, Philadelphia. The frame of the trailer is all plastic. The interior and exterior liners are plastic sheets, riveted to the plastic framing. The interior white panels are corrugated to speed the circulation of cold when cargo is packed tightly against the sides.

Insulation is placed between the plastic structural beams of the floor, making for a flat underside and increasing the usable height by approximately eight inches. It is 7 ft. ¾ in high and 34 ft long overall. Total volume is over 1800 cubic feet and weight 11,964 pounds.

Distant Reading Thermometer

DISTANT reading thermometers are products that made a significant contribution to the centralization of control and supervisory functions in refrigeration and air conditioning plants. Marketed under the trade name "Alnor", by Illinois Testing Laboratories, Inc., Chicago, the new type 1460, is a compact panel instrument that brings a myriad of readings from widely scattered temperature zones to a central point — from as far as 1000 feet away. It accurately reads temperatures of fluids, process atmospheres, wet and dry bulb temperatures, etc. Ranges are available between minus 100F and 400F. The most popular capacity on the instrument has been the 50 position size, although other models in the line run from single position to more than 50, in increments of ten.



Fifty-Station Alnor District Reading Thermometer by Illinois Testing Laboratories, Inc.

Air conditioning plants with typical Alnor distant reading thermometer installations are the Conrad Hilton Hotel, Chicago, and the U.S. Hospital Ship "Republic". Others are widely used in the cold storage and food freezing industries. Even skating rinks have had applications of this device, such as the Memorial Auditoriums at Buffalo and Syracuse, N.Y.

Mechanical Sound Detector Locates Machinery Defects

A NEW listening device makes it possible to detect the smallest internal defects in moving machinery without shutting down or otherwise taking the equipment out of service. Named the Engineer's Sound Detector, the device amplifies normally inaudible defect-caused noises and allows the user to accurately locate broken, loose, worn or bent parts in reciprocating engines, motors, gear boxes, compressors, pumps and similar equipment, regardless of size. It is also useful in determining the efficiency of steam traps and locating air or liquid leaks in underground piping.

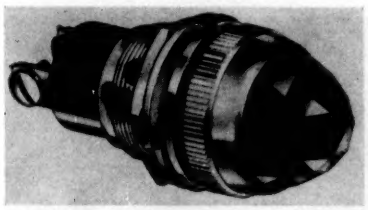
Resembling a doctor's stethoscope in design, the Engineer's Sound Detector utilizes dual detectors to transmit sounds to one or both ears as desired. Each detector contains both a pick-up diaphragm and an amplifying diaphragm to provide maximum sound vibrations. The twin detector feature makes it possible for the engineer or maintenance man to disten to two different points at the same time, thus pinpointing defects quickly and accurately.

When used on any type of gasoline or diesel engine, the extreme sensitivity of the Engineer's Sound Detector enables the user to correctly diagnose sounds caused by scored cylinders, bent shafts, worn bearings, excessive end play or lack of lubrication. Worn brushes, foreign matter, pitted shafts or bearings can be distinguished in electric motors, as can stuck or leaking valves in compressors and pumps. Early detection of such danger signals eliminates the problem of sudden equipment failure, minimizes costly downtime and permits systematic scheduling of necessary repairs.

A pair of extension rods are furnished with each Engineer's Sound Detector for reaching into remote places. An interchangeable bell stethoscope is also supplied to detect pressure or vacuum leaks around head gaskets, manifolds, etc. All metal parts are machined from stainless steel. Hose and ear plugs are made of soft, durable live rubber. The detector may be put together or disassembled in a matter of seconds and the entire assembly fits neatly into a handsome case.

New Pilot Lights

A NEW series of Oil-Tight Pilot Lights for severe industrial service is offered by The Dialight Corp. Brooklyn, N. Y. The units are of streamlined designed that gains in ruggedness from its very simplicity. This is in marked contrast with the "traditional" bulky and complicated oil-tight pilot lights now in use.

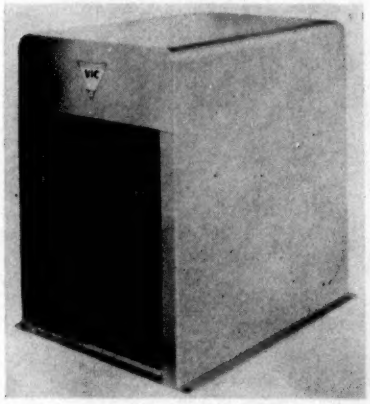


Oil Tight Indicator Light

Unique features of the new line, it is claimed, include the following: (1) Special provision for retained oil-resistant gaskets. (2) Glass lenses in several shapes with omnidirectional light spread. (3) Discs (with words, letters, or numbers) inserted behind flat glass lenses to deliver specific messages. (4) Wide range of incandescent lamps, with screw or bayonet base, as well as several neon types are accommodated. (5) Mounting in either 1-3/16 or 1 inch clearance hole. (6) Full range of lens colors are available. Optional details permit the choice of an assembly to fit any set of conditions.

Water Chiller

AN AIR-COOLED refrigerated water chiller is announced by the Vic Manufacturing Company, Minneapolis, Minn. It is a closed-type system, using the same water over and over again, which is especially desirable in areas where cool

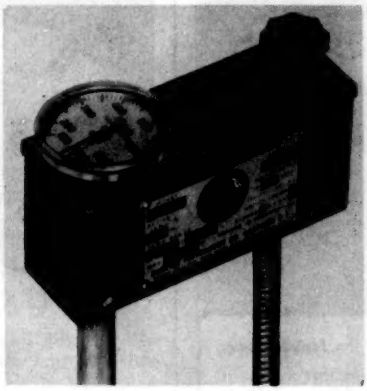


The Vic Water Chiller

water in large quantities is not available at reasonable cost, or where sewerage is too costly to use large quantities of water in cooling. The design of these water chillers assures full efficiency even in room temperatures of up to 115 F, and they are available in several capacities based on need.

Indicating Temperature Control

COMBINING an independent dial thermometer with a differential expansion type temperature control, is an entirely new idea in indicating instruments. Designed for both laboratory and industrial use, this new Burling Indicating temperature control Model LD-1S, is pictured below.



New Burling Indicating Temperature Control Model LD-1S.

Several adjustable temperature ranges are offered, including 30 to 240 F, which may be ideally applied to air-conditioning installations. Control is obtained by the differential expansion of two concentric tubes actuating a snap-acting switch through a lever. Switch is rated at 15 amp, 125-250 volts, a.c. Operating differentials are from plus or minus 1 to 4 F, depending on conditions. Sub-freezing point applications would be impractical.

This control is for local mounting and may be furnished with flange or threaded fittings. Tube is of brass or stainless steel, ⅝ O.D. x 14 inches long. Instrument head measures 5 x 1¾ x 2½ inches, exclusive of knob and thermometer dial. Literature and prices are available by writing.

New Ice Vending Station

A NEW ICE Vending Station has been designed and is now being manufactured by the K. G. Brown Mfg. Co., Inc. of Mattituck, N.Y. This vending station is complete in every detail and is ready for

Ice Vending Station Designed by K. G. Brown Mfg. Co.

immediate operation when placed on location.

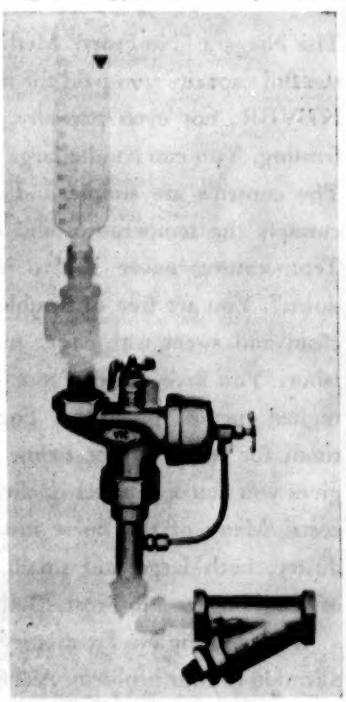
The station pictured above is covered with heavy gauge aluminum, measures 8 ft wide by 10 ft long by 9 ft high and weighs approximately 4800 pounds. The major feature of this station is the new rail system for bag and block vending. The area of contact of the rail system is negligible which allows free vending at all times. A combination of block, cube, party, or crushed ice can be vended as desired. Both block and cube can be dispensed from the same chute using a coin box for each commodity. Cubes, block, or crushed ice can also be vended with the same efficient operation.

The capacity of the factory tested station is better than 200-10 lb. bags and has ample storage space for additional 400 bags. All tiers are independently motorized so that at no time can the vendor be completely out of order due to mechanical failure.

The station is attractively painted and the flashing signs and fluorescent lighting effect adds to the attractiveness at night regardless of location.

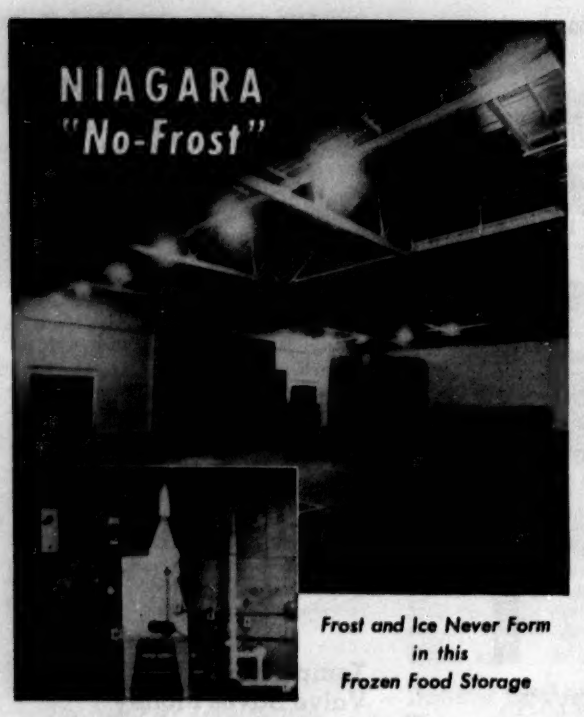
Temperature Regulator Valve Saves Money

WITH the new accent on automation, The Vic Manufacturing Co., Minneapolis, has come up with an easily-installed water saver and temperature regulating valve applicable to many industrial



The Vic Water Saver and Temperature Regulating Valve

uses. This equipment, the manufacturer says, is in successful use on degreasers, water-cooled air compressors, plastic moulding machines, and in many other processing equipment.



Frost and Ice Never Form in this Frozen Food Storage

SAVE TROUBLE AND EXPENSE EVERY DAY IN PRE- COOLING, FREEZING AND STORAGE; PROTECT FRESH OR FROZEN FOOD QUALITY

The Niagara "No-Frost" Method gives you always the full capacity you paid for in your refrigeration, NEVER, not even partially, interrupted for defrosting. You can handle large "live" loads easily. The controls are simple and always give you accurately the temperature and humidity you want. Temperatures never rise to interrupt the "pull-down". You are free of troubles; your rooms stay clean and sweet with easier maintenance and less labor. You save power; your compressors run at higher suction pressures. For every refrigerated room for temperatures below 32° F. this method gives you better product quality at lower operating costs. Many of the finest installations in the industry, both large and small, prove the benefits of the Niagara No-Frost Method.

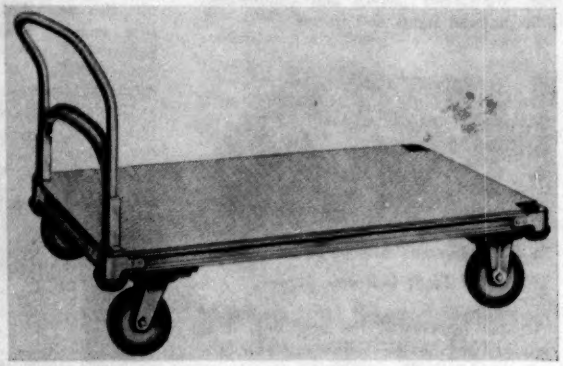
Write for the No-Frost story and data on its application to your problem. Ask for Bulletin No. 105.

NIAGARA BLOWER COMPANY
DEPT. IR-405, LEXINGTON AVE., NEW YORK 17, N. Y.

OVER 15 YEARS OF SUCCESSFUL EXPERIENCE PROVES THE VALUE OF NIAGARA NO-FROST

New Platform Truck of Magnesium

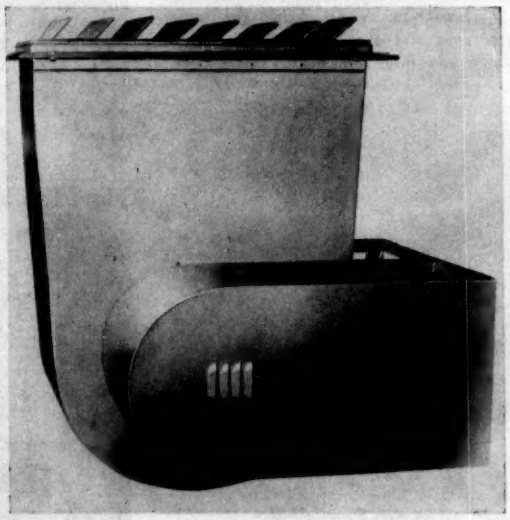
AN all-magnesium, 4-wheel platform truck for general materials handling use has been announced by Mayline Inc., Pinconning, Mich. It is offered in ten different models, all capacity rated to handle loads up to 1,000 lbs. Many design improvements have been incorporated to provide the user with greater serviceability and longer truck life. All parts are standard and replaceable, thereby lengthening equipment life and reducing maintenance expense. Handles are reversible and may be installed at either end of the platform. The handles are also interchangeable and can be replaced with special racks or superstructures for multi-purpose truck use. According to the manufacturer, the combined advantages of magnesium-lightness and magnesium-strength contribute to greater materials handling efficiency, reduce physical fatigue, and encourage greater productivity.



The New Platform Magnesium Truck

New Exhaust Blower

A NEW utility exhaust blower designed for more efficient movement of moisture-laden air has been introduced by the King Company of Owatonna, Minn. King engineers had moisture problems of dairy and food plants in mind in designing the new blower and have incorporated several standard features.



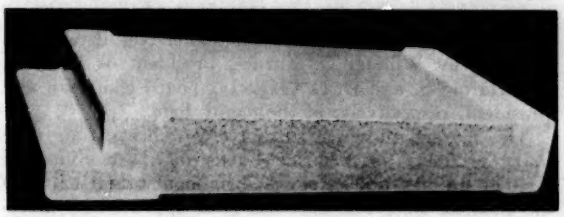
The New King Exhaust Blower

Automatic shutter closing when the unit is not operating is standard equipment as well as heavy duty blower wheel, constructed of heavily galvanized steel on rigid angle iron frame for rooftop mounting, the new King blower has enclosed motor and drive for protection against weather. It comes in four sizes. 15, 18, 21, and 24-inch blowers with ½ to 3 hp motors for movement of 2,000 to 9,000 cfm of air.

Plastic Sandwich Construction Panel

A STRONG, lightweight, insulated plastic sandwich construction panel with a wide variety of potential industrial uses has been developed by Haskelite Manufacturing Corp, Grand Rapids, Mich.

The panel, called Hasko-Struct, is composed of a Styrofoam (Dow expanded polystyrene) core with a facing of glass fiber cloth reinforced polyester sheet. In addition to lightweight, structural strength and thermal-insulating properties, the panel is also moisture-proof and corrosion-resistant.



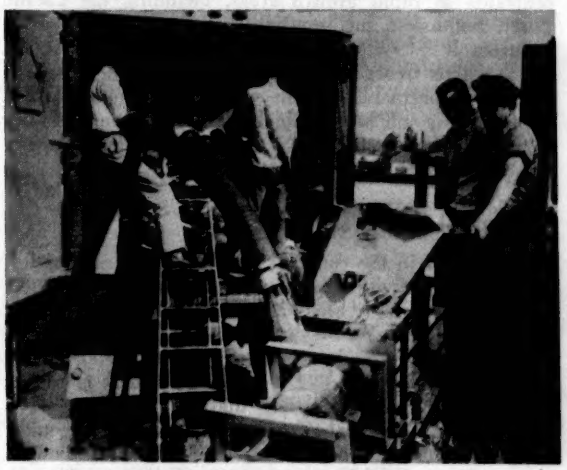
Section of a sandwich panel of Styrofoam core with facing of glass fiber cloth reinforced polyester sheet.

Hasko-Struct panels are available in a wide range of stock sizes and thicknesses or in special sizes. The Styrofoam core with a density of two pounds per cubic foot or higher is covered with the polyester reinforced glass fiber cloth in .018 inch and .032 inch thickness. The standard sandwiches are 1, 2, 3, 4 or 6 inches thick. Special sizes run as high as 18 inches. Standard width is 48 inches with lengths 96, 120 or 144 inches.

The versatile panels are now being field tested in several fields, including transportation, construction, cold storage and freezing industries.

Ice Slinger For Truck Icing

AN economical method for ice plants to get into the truck icing business is use of the Eskimo Crusher-Slinger, a combination of the Eskimo Model 250P ice crusher with a 1 hp motor permanently mounted on the Eskimo 5 hp Slinger, sold by Ballard Sales Company of Fort Worth, Texas.



Eskimo Crusher-Slinger icing a load of cabbage

It has a capacity of 350 to 450 pounds of ice per minute depending on the size of ice. With the crusher set on large size, the ice going out of the spout will be nearly walnut size; set it on fine, and the ice will come out snow. The discharge spout swivels 180 degrees. It has a large rubber hose, 4½ inches in diameter to reduce friction. Ice is discharged about 25 feet. Ten feet maximum length of hose. Also available with 10 hp motor with 15 feet of hose.

Motor will be mounted free if prepaid to factory. Motor must be in perfect condition (shaft true and no end play). A 7½ hp motor can be mounted for a small additional fee.

YOU NEVER COMPROMISE ON QUALITY WITH

ANHYDROUS AMMONIA NATIONAL TRADE REG. U.S. PAT. OFF. MARK

ANHYDROUS AMMONIA

Always Uniform

Always Dry

Guaranteed 99.99% Ammonia

Any of the following distributors will give you fast delivery:

Colorado—Denver—The Chemical Sales Co.

Illinois—Chicago—The Creamery Package Mfg. Co.

Indiana—Indianapolis—Wm. Lynn Chemical Co., Inc.

Iowa—Sioux City—Kennedy & Parsons Co.
Waterloo—The Creamery Package Mfg. Co.

Kansas—Wichita—Barada & Page, Inc.

Kentucky—Louisville—Merchants Chemical Co., Inc.

Louisiana—New Orleans—Barada & Page, Inc.
New Orleans—Whitman-Holloway-Oliver

Michigan—Detroit—Davis Supply Co. of Detroit, Inc.
Flint—Davis Supply Co.

Minnesota—Minneapolis—The Creamery Package Mfg. Co.

Missouri—Kansas City—Barada & Page, Inc.
Kansas City—The Creamery Package Mfg. Co.
St. Louis—Barada & Page, Inc.

Nebraska—Omaha—Kennedy & Parsons Co.

Ohio—Cincinnati—John H. Schafer, Inc.

Oklahoma—Oklahoma City—Barada & Page, Inc.
Tulsa—Barada & Page, Inc.

Tennessee—Nashville—John Bouchard & Sons Co.

Texas—Austin—R. M. Hughes & Co.
Corpus Christi—Barada & Page, Inc.
Dallas—Barada & Page, Inc.
El Paso—H. J. Baron Co.
Houston—Barada & Page, Inc.
Odessa—Barada & Page, Inc.
San Antonio—R. M. Hughes & Co.

Utah—Salt Lake City—Louis A. Roser Co.

Wisconsin—Milwaukee—Reichel-Korfmann Co.

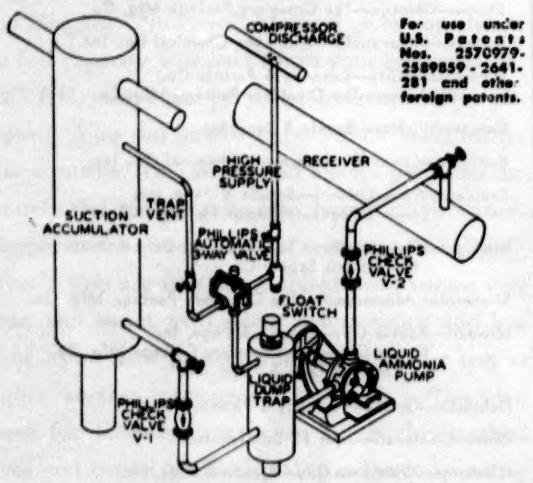
BARADA & PAGE, INC.

Ammonia "Slop-Over" Handled Automatically by PHILLIPS Liquid Return System

Protects Compressors, Saves Power, Makes Defrosting and Maintenance Simpler

Even in the best designed refrigeration systems, ammonia "slop-over" is a common occurrence. Two stage compression systems, booster systems and control ammonia compression systems subject to fast temperature and pressure changes are especially likely to have liquid in suction lines. This condition can seriously damage compressors which should handle dry gasses only.

Engineers at H. A. Phillips & Co. have devised a system that automatically returns "slop-over" directly to the receiver without regenerating and re-condensing the liquid. As shown in the drawing below, the Phillips Liquid Return System takes liquid ammonia which has collected in the accumulator, drains it through an outlet valve and check valve (V-1) into a liquid trap. Drainage occurs when the trap is at a low pressure. The trap is vented to the accumulator through a three-way valve and vent line. As the trap fills, a float switch is activated, energizing a three-way valve. This valve closes the vent line and connects the compressor discharge to the trap. Pressure builds up in the trap and closes check valve V-1. Pressure in the trap then reaches the same pressure as the receiver, opening check valve V-2 and allowing gravity to carry the liquid to the receiver. If gravity flow is not possible, a liquid ammonia pump is used. High pressure at both the pump inlet and outlet prevents flashing the liquid into gas. When the liquid trap is empty, the three-way valve is de-energized, closing the high pressure line to the trap. The trap is again vented to the accumulator, allowing liquid to drain once again into the trap.



Phillips Liquid Return System

This arrangement is highly efficient since only one pound of compression gas is required to move 25 pounds of liquid. There is practically no loss of refrigeration potential of the recovered liquid. The system also permits oil flushed into the accumulator to be easily drained.

A number of "packaged" variations of this system in capacities to 1000-tons are available to handle all arrangements of accumulator and receiver locations. For full details, write . . .

PHILLIPS

H. A. PHILLIPS & CO.

DESIGNERS AND ENGINEERS
REFRIGERATION CONTROL SYSTEMS

3255 W. Carroll Ave. • Chicago 24, Illinois

PRESS BRIEFS

Beatrice Creamery Candy Co. Merger

MERGER of The D. L. Clark Co., Pittsburgh, maker of the nationally known Clark candy bar, with Beatrice Foods Co., Chicago, one of the country's largest producers of dairy foods, awaits only the formal approval of Clark stockholders to become effective, it was announced by William G. Karnes, president of Beatrice, and Harold S. and D. L. Clark Jr., board chairman and president, respectively, of the candy firm.

The merger provides further diversification in non-dairy products for Beatrice Foods by the addition of another product and established national brand name to the Beatrice line. The deal has been approved by directors of both companies, and only a formal vote by Clark stockholders remains as the final step.

Terms of the merger call for owners of Clark stock to receive a total of 85,400 shares of Beatrice Foods common in exchange for all assets of the candy firm. This is a ratio of 3.5 shares of Clark for one share of Beatrice. Clark shareholders were to meet September 30 to vote on the merger.

Beatrice Foods Co.'s program of diversification was reflected in the adoption of its present name in 1946, after doing business as Beatrice Creamery Co. since its founding in Nebraska in 1898. Its non-dairy products and services include frozen foods, margarine, LaChoy Chinese foods, salad dressing, baking ingredients, meat products and fruit ades, as well as commercial livestock feed and public cold storage warehousing.

With general offices in Chicago, Beatrice Foods operates 314 plants and branches in 35 states, District of Columbia and Hawaii. Its recent expansion has concentrated in rapid growth areas, including the Pacific Coast, Southwest, medium-sized cities and metropolitan suburbs. It gets its name from the town of Beatrice, Neb., where George E. Haskell and W. W. Bosworth founded a partnership from which the company grew. The company still has a branch there. Headquarters were in Lincoln before the move to Chicago. The company has about 12,000 employees.

Foremost Stock Listed

TRADING in the common stock of Foremost Dairies, Inc., one of the largest units in the dairy products field opened recently on the New York Stock Exchange. The opening trades were three lots of 1,000 shares each. These were followed by another block of 2,500 shares. All sold at a price of $24 a share. The stock closed at 23⅜ on total trades of 15,900 shares.

Paul E. Reinhold, chairman of the company, bought one of the initial 1,000-share lots. The others were bought by two directors of Foremost, James C. Penney and E. V. Rickenbacker, chairman of Eastern Air Lines Inc.

As of June 30 there were 6,444,776 shares of Foremost common outstanding. The company has more than 30,000 stockholders. The company has plans for a continued program of development which is expected to boost sales above the present rate of $400 million a year.

Mr. Reinhold said that by marketing new products developed by research and by using intensive new merchandising methods they intend to bring about a large per capita increase in the consumption of dairy products in the area served by the company.

Frozen Food Distributors Buy Cold Storage Plant

SEATTLE'S largest frozen-food distributors, Wilson Peterson and Howard D. Shaw, who do business through a number of corporations, have purchased the City Ice & Storage Co. and leased its facilities in a $600,000 transaction.

Robert H. Ewart, Richmond Highlands real-estate man who negotiated the deal, said the transaction involves a contract totaling $360,000 and an option amounting to $240,000. One building in the plant, at 4758 Shilshole Ave., has been converted entirely for distribution purposes. The main building contains five floors for storage. There also are two office buildings and a garage.

Peterson and Shaw took over a part of the plant last November for their operations known as Seattle Frosted Foods, their present leasing corporation. The two men also do business as Pacific Arctic Gardens and as Frosted Foods, Inc.

City Ice & Storage, one of Seattle's first cold-storage plants, was established in 1913 by James Bennett, who came to Seattle from London, England. Present owners are the founder's sons and daughters, Stella and Mary Bennett and Dudley and Roy Bennett, all of Seattle.

Replacement value of the plant is estimated in excess of $1,000,000. The original building was designed by William Bain, Seattle architect.

Air Conditioned New York Subway Cars Given Test Run

THE NEW YORK City Transit Authority has started tests of an air conditioned subway car. It noted, however, that even if the tests are successful, it may be a "matter of years" before the city's underground system can be equipped with cooling units.

The car made the trial run from Times Square to Main Street in Flushing, L. I., at a temperature of 70 degrees. It was air conditioned by Safety Car Heating and Lighting Co., Inc., of New Haven, Conn., working with Carrier Corp. and Transit Authority engineers. It was equipped with four ton-and-a-half capacity units under the roof. Air is taken in through grilles in the car's ceiling, passes through cooling coils, is dehumidified and then distributed through air deflectors at the base of each unit.

The Transit Authority is weighing merits of this system against a system of fans built into the car ceiling. Attached to the air-conditioned car in the trial run was another car equipped with the second system. Thermometers suspended in the interior of this car registered more than 10 degrees higher temperatures during the run than those in the air-conditioned car.

Charles L. Patterson, chairman of the Transit Authority, said he was "very happy" over the results of the test run. Mr. Patterson said further tests will be made to judge effectiveness of the system both for air-conditioning and for heating cars in winter weather.

Ammonia Fumes Cause Hazard in Co-op Plant

THREE persons were overcome and at least 40 other employees were forced to flee for safety after an ammonia filled pipe broke in the Washington Cooperative Farmers Association plant, Seattle, Wash., filling the large building with fumes. The pipe, which is used to provide ammonia for refrigerated trucks, was broken when a truck snapped it at the loading platform.

HOWE AMMONIA COMPRESSORS feature full internal force-feed lubrication to every bearing.

"Old in years Young in Ideas"

HOWE

OFFERS MORE PRODUCTS OF MODERN DESIGN FOR LOWER COSTS

Refrigeration specialists of 43 years, in complete systems or any of its component parts, Howe engineers can supply you with correct equipment to provide exact humidity and temperature control for any given product or service.

RAPID FREEZE UNIT COOLER

SHELL & TUBE CONDENSER

SINCE 1912, manufacturers of ammonia compressors, condensers, coolers, fin coils, locker freezing units, air conditioning (cooling) equipment. Immediate delivery!

HOWE ICE MACHINE CO.

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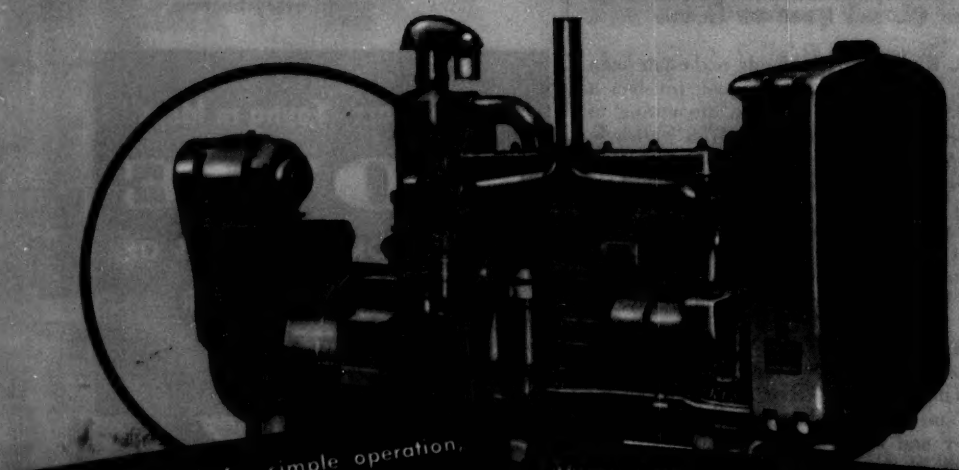
Distributors: Several Exclusive territories still available. Your inquiry invited.

A MAJOR DEVELOPMENT IN MODERN ELECTRIC POWER

NEW CAT* GENERATOR



Nothing like it for simple operation, flexible application, compact power, rugged construction, long life and ease of maintenance.

Heart of the new line of Cat Diesel Electric Sets, providing in one package the best features of self-regulated and externally-regulated generator plants. You get more for your money.

Easily paralleled with other generators now in use.

MAJOR ADVANTAGES OF THE NEW CAT GENERATOR

1. MATCHED TO ENGINE PERFORMANCE. Each Cat Generator is designed and built to exactly match the Cat Engine powering it, assuring maximum efficiency in a simple, complete package.

2. SELF-REGULATING, WITH CLOSE VOLTAGE REGULATION. Designed to meet the needs of all applications now served by self-regulated or externally-regulated generators. Provides steady voltage from no load to full load.

3. ADJUSTABLE TO SPECIAL CONDITIONS. During initial installations, terminal voltage and voltage "droop" can be adjusted to meet special conditions of applications. After that, adjustments are sealed and *no further adjustments necessary.*

4. EASY TO INSTALL. No complicated switchgear or external voltage regulators are needed.

5. VERSATILE IN APPLICATION. Easily paralleled with other generators now in use.

6. SMALL AND COMPACT. Occupy less space than other generators. Reduction in frame size, close coupling, top-mounted exciter results in a shorter over-all package length.

7. BIG ELECTRICALLY. Excellent motor starting ability—capacity to handle the surge of heavy starting loads.

8. EASY TO MAINTAIN. Heavy-duty, single-bearing, close-coupled construction. The single bearing is easily accessible and is lubricated from an oil reservoir that requires filling only once a year.

9. RUGGEDLY CONSTRUCTED. An improved heavy-duty, laminated pole rotor decreases pole heating and increases rotor life.

10. DESIGNED FOR LONG LIFE. Built to match the long life of the Caterpillar Engine powering them.

Another example of Caterpillar Leadership in Action!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

Combining the latest developments in design, materials and production, the new Caterpillar Generator provides you with advantages never before possible in packaged power plants—you get more for your money. Whatever your requirements, it will pay you to look into the new Cat Diesel Electric Sets with these advance-design generators. Get the full facts from your nearby Caterpillar Dealer!

CATERPILLAR*

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NEW HEAVY-DUTY ELECTRIC SETS

In the Spotlight

A BUYERS DIRECTORY of the Industrial Refrigeration Industry is a new annual feature included in this issue with 16 pages, listing products; manufacturers of leading products with branch offices; and trade names. This will fill a real need in the industry, as no such information has heretofore been available in a compact and complete form. Its entire aim is to provide readers with a compendium of information that will be useful and serviceable to them, resulting from a complete survey of the industry, as one more service provided by the staff of INDUSTRIAL REFRIGERATION. The new Directory starts on page 33.

FROZEN FOODS in a wide variety are packed at the Sunnyvale, California plant of Libby, McNeill & Libby. These include many vegetables and fruits grown in various sections of California. A new refrigerating unit, finished during January of this year, is complete with freezing and storage facilities. A story of this new operation in text and pictures starts on page 13.

ICE SKATING as a summer sport has been added to the tourist attraction at Sun Valley, Idaho. An outdoor ice skating rink is now under construction and is expected to be in operation in December. For description and pictures see article on page 16.

CAUSES of most Synchronous Motor failures are well within the control of supervisers and operators, says J. F. Martin, Hartford Steam Boiler Inspection and Insurance Company. His article on page 17 will be of interest to owners and operators of this type drive for refrigerating equipment.

OPENED last June, the United States Cold Storage Corp plant at Fort Worth, Texas has completed a very successful first quarter. One of the improvements over previous construction was the use of pre-stressed concrete beams giving clear or column-free storage areas, thus increasing the revenue earning floor space by better than five percent. Description of this new plant, with pictures, is included in the article starting on page 22.

A SHOP-MADE simplified dehumidifier has been put in service by the Camden Refrigerating and Terminals Company, Camden, N. J. and it has been very successful in performing the purpose for which it was designed. The device is described and illustrated by W. Warren Wilson who made it, in article on page 70.

FREEZER and storage space for frozen foods has been added to the Kroger Grocery Company's warehouse at Toledo, Ohio which serves as a distribution center for Kroger within a forty mile radius. It is a one-story building, in line with present construction trends. Description and pictures of the refrigerating system are included in the article which starts on page 27.

OUR FREE Enterprise System is one of both profits and losses is forcefully brought to mind by U. S. Treasury statistics which show that in 1952, 34.1 percent of active U. S. corporations showed no net income. All too often figures like the above show that profits are not so easy to come by; that they are earned in our dynamic, competetive economy by hard work and efficient operations. Honest profits are something to be proud of.

TAKING the N A P R E lead this month, R. E. Manns hopes to provoke some lively and interesting discussions in the Association's traditional Bureau of Refrigeration Information at the 46th annual convention. Topic of this year covers "Operating Economics." In his paper on page 50, Mr. Manns reviews the advantages of modern multi-cylinder machines over their VSA predecessors; then in multi-stage applications, he goes on to make claims for the high-speed reciprocators over rotary types finding popularity in such hook-ups.

A DISNEYLAND Tour will be a feature attraction of the entertainment program of the N A P R E Convention, designed especially for the women and children but open also to the men. This unusual display is fully described and illustrated in article on page 55.

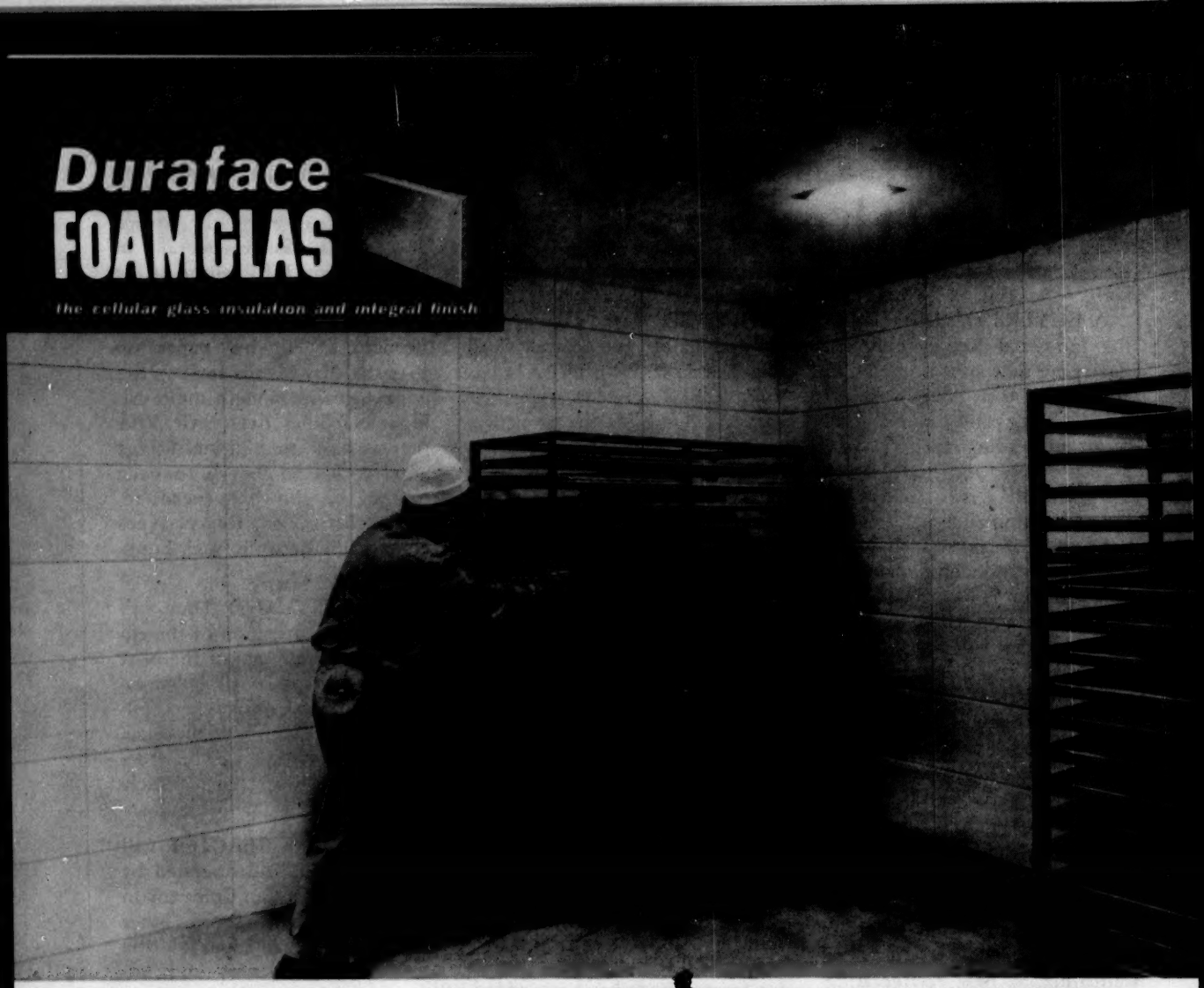
A NUCLEAR REACTOR will be constructed and operated by the Continental Can Company in cooperation with seven other companies for research on the development of new and improved products and materials in the packaging field. It will be completed in late 1956 or early 1957. For description and illustration see page 20.

GROWTH of the air conditioning industry has filled in the summer valley demand for electric power and created a need for increased winter load, according to Geo. S. Jones, managing director of the Air Conditioning and Refrigeration Institute. Comments by Mr. Jones on this situation are included in the article on page 60.

PUBLIC Refrigerated Warehouses expect to have more than 480 million cubic feet of space in operation by the end of 1955, to meet the increased demands of the perishable foods industry, of which more than 270 million cubic feet will be freezer space.

Duraface FOAMGLAS

the cellular glass insulation and integral finish



This is a pharmaceutical tablet drying room recently completed by SCHERING CORPORATION at their Union, N.J., plant. They picked new Duraface FOAMGLAS to insulate and finish the walls in one operation. They say: "These remarkable cellular glass blocks give us dependable insulation plus an attractive and durable finish that we can wash down as often as necessary."

Tough, waterproof Duraface FOAMGLAS insulates and finishes these walls

One material, erected in one operation is both insulation *and* finish for the walls you see above. It's *Duraface* FOAMGLAS . . . the remarkable cellular glass insulation intra-fused with a hard white crust of denser sealed cells.

This unique new product gives you all the important benefits of long-lasting, high-performance cellular glass insulation PLUS an integral finish that:

- **can't peel or separate!**
- **is safely and easily washed because it's waterproof!**
- **is fireproof and vermin-proof!**
- **takes greater impacts than standard applied finishes!**

Find out today how you can solve *your* insulation and finish problems with one material . . . *Duraface* FOAMGLAS! Write us for a sample and descriptive folder.

Pittsburgh Corning Corporation

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In Canada: 57 Bloor St. W., Toronto, Ontario

*A trademark of Pittsburgh Corning Corporation

New Duraface FOAMGLAS is completely waterproof. You can scrub it or hose it down without impairing its high insulating efficiency.

Out in the fields the growers pick and crate the berries for packing and freezing at the Sunnyvale plant of Libby's

Modern Plant Speeds Processing Frozen Foods

SUNNYVALE in California's Santa Clara Valley, home of Libby's largest frozen food operation, is a bee-hive of activity. Operating on a year round basis, the plant packs a wide variety of Libby's frozen foods to be delivered to all parts of the country. The plant is under the jurisdiction of Libby's California Fruits Division and is managed by W. O. Ross.

Libby buyers have found that conditions in the Santa Clara Valley are ideal for broccoli, cauliflower, strawberries, lima beans and green peas. Spinach is obtained from the Salinas and San Juan Valleys; brussels sprouts come from Santa Cruz and Half-Moon Bay. Peas are grown in the Patterson area. Growers are contacted by field men in areas where climatic and soil conditions are best suited to produce selected products.

Plantings are arranged far in advance to satisfy Libby's packing needs and buyers maintain daily contact with the growers. The progress, the quantity and the quality of produce are closely watched until the peak of freshness is attained when the plant is immediately informed of the quantity available for processing. The fresh produce is trucked into Sunnyvale for processing and packaging.

This aerial view of the Libby plant at Sunnyvale, California gives some indication of the size of the frozen food operation. A wide variety of products are packed and frozen at this plant for delivery all over the country.

The produce, tested, inspected and graded, is processed and packaged in an immense reinforced concrete building, 160 by 300 feet in size. Here equipment worth many thousands of dollars is put into operation to bring frozen food at its best to the consumer.

Women on the vegetable operations are lined on both sides of cutting and sorting tables that have large conveyor belts for moving products from the water tanks where they have been washed. They remove all foreign matter and produce that does not meet quality standards. A conveyor takes the produce to the blancher, an operation that helps the vegetables retain freshness and color. At this stage, the produce is placed in carton containers by women stationed at both sides of the conveyor belt. Some products, such as peas, chopped spinach, chopped broccoli, and lima beans are filled by automatic ma-

Reprinted by permission from "The Scanner", company publication of Libby, McNeill & Libby.

chinery. Packages are taken from the wrapping machines and placed in a tray which holds 36 packages. A freezing rack holding 36 trays is loaded and hauled to the freezer by electrically driven lift trucks.

It's only a matter of minutes between the time the produce is packaged and placed in the freezer. After being quick-frozen, the produce is taken to the casing room where it is packed for storage until delivery. A spur track along the freezing building is able to hold as many as six refrigerated railroad cars at one time. There are also provisions made for refrigerated truck loading.

When Libby started in the frozen food line, it used existing cannery accommodations in various areas of the country where the produce was packaged, then trucked to freezers several miles away. The operations were begun at Walla Walla, Washington at the plant there in the 1946-47 season. However, Walla Walla operates on a seasonal basis and it was more desirable to pack frozen foods the year round.

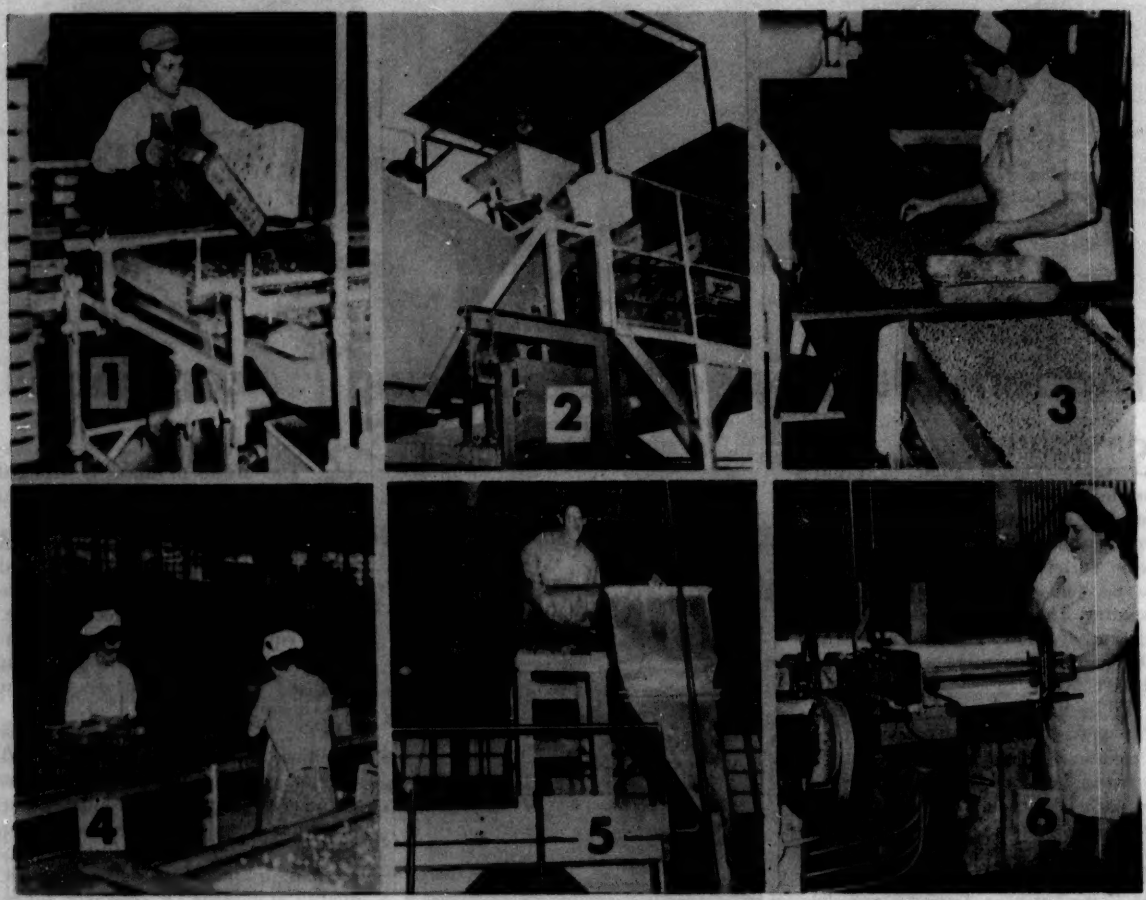
Refrigerating Unit Built

In 1948 Libby started packaging produce for the frozen food market at the Sunnyvale plant; by 1949 the operation was in full gear. However, frozen foods were packaged only during the months the canned goods were not being processed as the lines were set up in that building. In June, 1953 a processing building was completed for the frozen food line. Still the packages were being trucked to outside freezers. The expense and inconvenience of this process prompted Libby to build a freezer unit in conjunction with the Sunnyvale plant. The building of a refrigerated unit, complete with storage and freezing operations, was completed at Sunnyvale during January of this year.

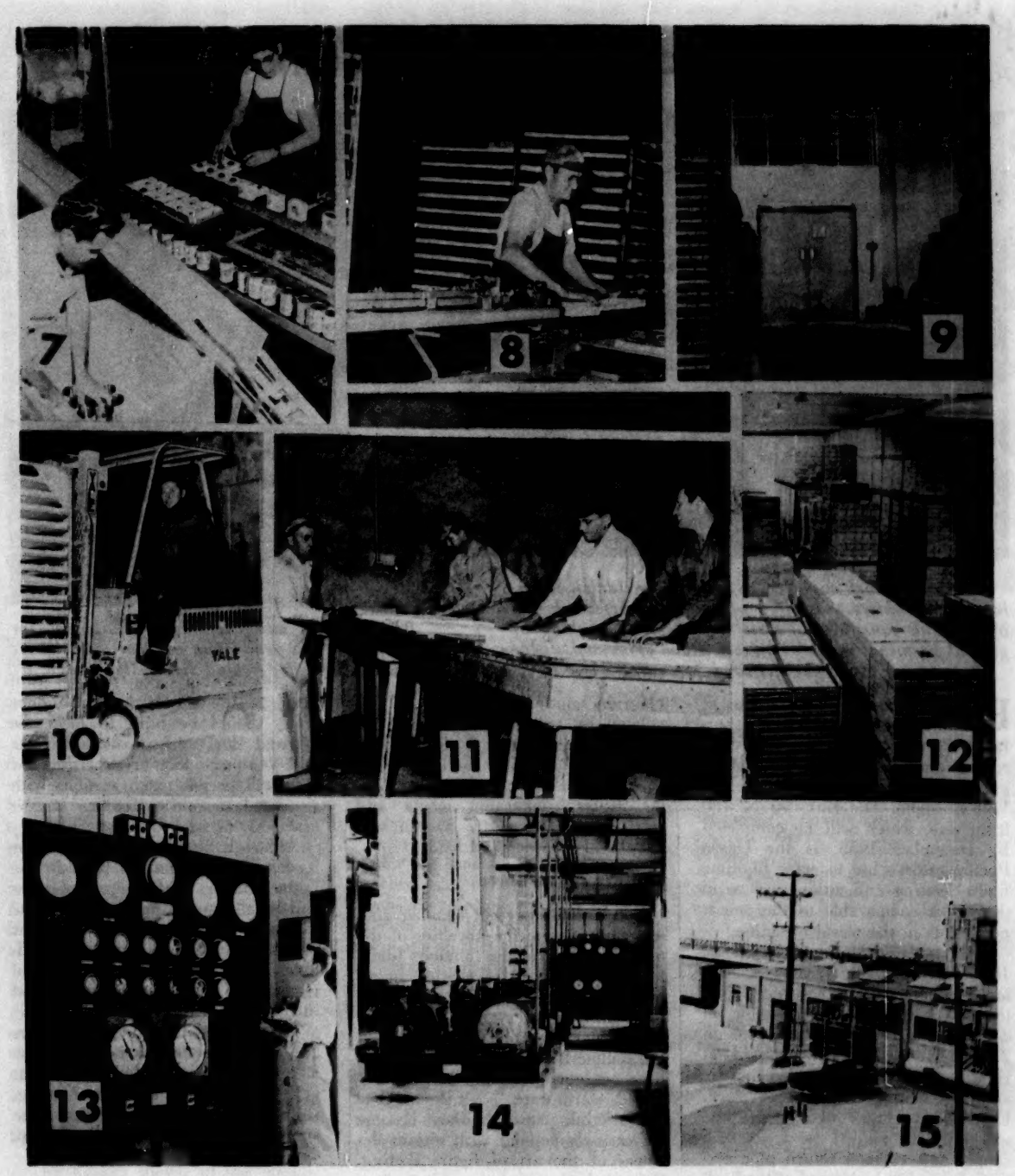
The addition, constructed of concrete, houses two holding rooms, each 120 by 160 feet, a case-in room, 120 by 105 feet, and a battery charging installation room. The temperature in the holding room is minus 5 F.

The building also contains nine freezing tunnels which have a constant temperature of 40 F below zero. The total capacity of these tunnels is 125 tons. In these tunnels foods are quick-frozen in a matter of from two to four hours, depending upon the product and other variables. They are then stored in the holding rooms until loading on refrigerated railroad cars or refrigerated trucks. Sunnyvale's refrigerating plant consists of

(Continued on page 75)



Down the production line in Libby's Sunnyvale plant. 1. — The first process the strawberries go through after they have been delivered to the plant is the washing. Here the berries are dumped into the washer. 2 — Peas are dumped into the hopper where they are carried into the cleaner and washer before being inspected and packed for freezing. 3 — After the peas have been washed, they go along a conveyor belt where they are hand inspected and foreign material is removed. 4 — After washing, the strawberries are carried along the conveyor belt where the women hand inspect them and trim the berries when it is necessary. 5 — After the berries have been washed and trimmed they go through a slicing operation. The sliced berries are mixed with sugar. 6 — Knocked down cartons are being fed to the filler where they are formed and filled automatically. This operation is carried out only with the vegetables.



Additional processing views in Libby's frozen food plant. 7 — Strawberries are packed in special cartons and cans. Here empty cans are being fed to the berry filler while the berries are trayed prior to freezing. 8 — The vegetables are packed in unlabeled cartons and wrapped before going into the freezing room. Fruits are packed in cans and cartons that already have the labels printed on them. 9 — Interior view of freezer storage shows skids of trays on which packages of frozen foods have been placed. The trays are separated in this manner to allow plenty of room for the air to circulate, insuring uniform freezing of food. 10 — Jeep loaded with frozen foods being driven out of the freezing tunnel. Note the mist around the bottom of the truck caused by the extreme change in temperature. 11 — Packing operations known as casing are being performed. The frozen foods are ready to be stored until being loaded in refrigerated railroad cars for delivery to distributors. 12 — Closeup view of trays of frozen foods in the storage area in the freezer. Note how some of the packages have been boxed for delivery. 13 — Checking the instrument panel of the refrigeration system. 14 — Automatic refrigeration showing compressor area. In the background is the instrument panel of the system. 15 — Exterior view shows sections of refrigeration equipment at the right. On the far left are refrigerated railroad cars.

Sun Valley Adds Ice Rink For Summer Skating

Ed Seagle, chief engineer at Sun Valley, Idaho, superintends machinery unloading operations, the second step of the rink construction. First step was the breaking of ground by means of an oversize railroad spike and sledge manufactured from ice.

Brine coolers and compressor equipment for Sun Valley's new year-round outdoor artificial ice rink is unloaded behind Sun Valley Lodge.

FIFTEEN and a half miles of piping will be used in the surface of the world's largest year-round, outdoor ice rink, for which ground has been broken at Sun Valley, Idaho. The rink, 90 × 180 ft in size, which will be completed by December 1955, is the Union Pacific resort's bid to enter big-time figure skating and attain a place in that sport comparable to the one it now holds in the world of skiing.

The rink's surface will be on an 18 inch cinder fill. Treated 3 × 4 inch timbers will be embedded into this fill lengthwise of the rink on 4 ft. centers. One-inch black pipe on 2½ inch centers will be laid at right angles to the embedded timbers and will be pipe-strapped in place. Each loop or pair of 1 inch pipe will be field welded to a 10 inch supply and 10 inch return pipe system. These will be located at the back side of the rink in a covered pipe trench.

Refrigerating Equipment

To maintain a perfect skating surface at all times 324 tons of refrigeration will be needed. This will be furnished by two 200 hp compressors, two 40 hp compressors and one 75 hp compressor. The engine room will be directly behind the rink underground. A circulating brine system will refrigerate the rink. The system will have 9500 gallons of calcium chloride solution, which will be circulated by two 60 hp pumps.

The installation will also require four condensing economizer units, each with an operating load of 11,900 lbs, water condensing media and refrigerant. The entire system will have a 719 hp demand load.

Skating in Summer

Sun Valley's present summer rink was built as one the novelties of the original layout at the fabulous Idaho mountain village. Ice skating in an outdoor setting of green lawns and blossoming flower beds under a sunny blue sky, one more paradox, the summertime equivalent to winter-time outdoor swimming in glass enclosed, warm-water pools.

The rink, however, has become increasingly popular with serious devotees of the art of figure skating. Expert skating instructors are provided. There is an active figure skating club that gives tests according to the regulations of the United States Figure Skating Association, and, under the direction of Bruce Clark, a colorful ice carnival is produced that furnishes incentive and competition to ambitious skaters. Parents of talented youngsters who have trained on indoor rinks during the winter have been particularly enthusiastic about the benefits derived from outdoor skating in the summer months.

It was inevitable that a rink as large as the standard sized indoor rinks should be built to meet the demand for adequate space. The 16,700 square foot area of the new rink will permit patch sessions with restricted space for practice at several sessions each day.

Although Sun Valley is noted for its luxurious accommodations in the Lodge, skaters with great ambitions and small purses need not hesitate to make the new rink their goal for next summer. Chalet rooms are available for as little as $2.50 a day and reasonably priced meals are served in the Continental Buffet.

For families comprised of skaters and non-skaters there is always the added advantage at Sun Valley that golf, tennis, skeet and trapshooting, riding and fishing will provide some sport for every member of the family.

Foremost Buys Whey Producer

THE Western Condensing Company, Appleton, Wisc., large processor of whey has merged with Foremost Dairies Inc., Jacksonville, Fla., Kenneth W. Ward, Foremost president has announced. The merger, he said, is on the basis of 1.2 shares of Foremost common stock for each share of Western common stock, subject to approval by stockholders of both companies.

Synchronous Motor Failures Can be Reduced

J. F. MARTIN
Asst. Chief Engineer, Machinery Div.
The Hartford Steam Boiler Inspection and Insurance Company

The results of this study again stress the fact that the causes of the vast majority of synchronous motor failures are well within the control of supervisors and operators. A well planned and properly supervised preventive maintenance program will pay dividends in materially reducing unscheduled outages of electrical equipment vital to plant production.

THE principle of the synchronous motor was known as early as 1869, but it is only within the past 35 years that its particular characteristics have been used to advantage. The design of synchronous motors has, over the years, been so improved that much broader applications can now be made. In addition, control and protective devices have been developed which now include such functional features as:

Supplying Power to Motor

1—Means of automatically applying a-c power to the motor.

2—Overload protection for motor windings.

3—Undervoltage protection of the instantaneous or time delay types.

4—Means for automatically applying field excitation.

5—Provision for automatic removal of the field excitation if the motor pulls out of step with shut down or provision for automatic re-synchronizing where conditions permit.

Synchronous motors have several distinctive advantages over induction motors. Their operating efficiency is higher, especially at medium and low speeds. Their speed is constant, which is of advantage in certain drives.

Operating a plant at high power factor makes available more energy for useful work and cuts down the line losses, making available additional current-carrying capacity for increases in load on these lines. An induction motor operates with a lagging power factor and derives its excitation from the line, whereas a synchronous motor may operate either at 100 percent power factor or at a leading power factor if so designed.

Failures

The figures shown in the accompanying table are based on a study of failures of synchronous motors occurring during 1952, 1953 and 1954 and investigated by The Hartford Steam Boiler Inspection and Insurance Company. The data was obtained from studies of approximately 175 accidents made at the scene as soon as possible after each failure. These studies were often continued in the manufacturer's plant or in a service shop where the motors were partially or fully dissembled. All investigations were made by men especially trained for such work and experienced in determining from the available evidence, the part which failed first and the direct cause of the failure. (See Table 1)

The intent of the analysis in Table 1 is to bring to the attention of the reader the kind of things that cause synchronous motor failures as a means of pointing the way to more effective accident prevention in connection with this class of equipment. However, it should be borne in mind that the seriousness of the accident is not always indicated by the initial part that failed. For example, when a bearing fails it may entail only replacement of the bearing itself at small monetary cost, or it may lead to such extensive damaging of other parts that the whole motor must necessarily be replaced.

Line Surges

The sources of over-voltage are many and varied. The most common ones are lightning, physical contact with a higher voltage circuit, resonance effects in series inductive-capacitive circuits, intermittent grounds and switching surges.

The season for electrical storms is with us again in many sections of the country, and lightning seems to like to strike power plants. Approximately ninety percent of the industrial damages it causes is to vital electrical equipment, motors, generators, transformers, or to power house chimneys. But this physical damage, while costly, may be of small consequence compared to the loss of power and stoppage of production it entails.

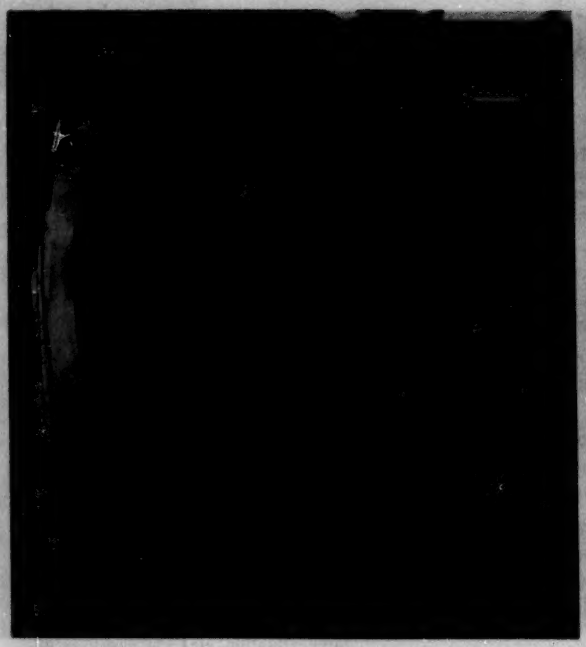
Electrical Equipment Failures

A record of failures of electrical equipment caused by lightning has been maintained by the company for many years and it is encouraging to note that substantial progress has been made with the passing of the years in the elimination of accidents from this cause. However, such accidents still account for a substantial percentage of the total, so there is room for further improvement. It is generally conceded that each installa-

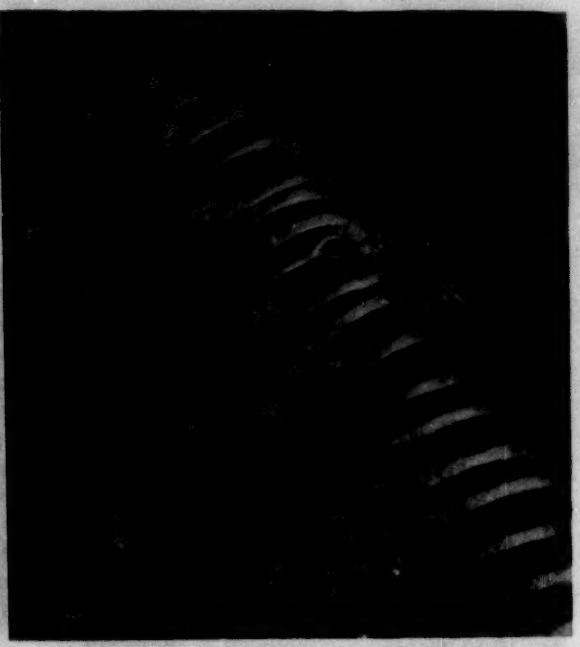
TABLE 1. CLASSIFICATION AND CAUSES OF FAILURES

Failure	Percent
Stator windings	50
Fields	24
Bearings	9
Amortisseus windings	8
Brush rigging and field leads	7
Shafts	2
STATOR WINDINGS	
Lightning or line surges	24
Moisture	20
Deterioration of insulation	14.5
Foreign material	14
Defective material and/or poor workmanship	12
Overloading	6
Inadequate ventilation	2
Single-phase operation	1
All others	6.5
FIELDS	
Mechanical stresses (centrifugal force, vibration, etc)	42
Foreign material (dust, dirt, etc.)	26
Deterioration of insulation	19
Defective field discharge resistor	5
Over excitation	3
All others	5
BEARINGS	
Inadequate lubrication	80
Improper operation of driven machine	14
All others	6
AMORTISSEUR WINDINGS	
Loss of excitation	50
Improper operation (jogging, etc.)	30
External violence	10
Fatigue	10
BRUSH RIGGING AND FIELD LEADS	
Foreign material (dust, dirt, etc.)	55
Vibration	45
SHAFTS	
Mechanical overload (sudden stoppage of driven machine)	50
Defective material	50

From "The Locomotive," of The Hartford Steam Boiler and Insurance Company.



Stator winding burnout from single-phase operation



Typical effect of line surges on stator winding end turns

tion must be engineered individually for proper lightning protection.

The larger manufacturers today have specialists who have made detailed studies of the problems involved in lessening accidents from this cause. They have found that there is no "cure-all" which can be applied generally, but that a careful study of conditions existing at each location must be made. Wherever troubles have been experienced from lightning it is well to call in such specialists, and after suitable protective equipment has once been installed at their direction, to follow their advice in maintenance.

In spite of apparently good protective equipment, lightning frequently causes severe damage if the arrestor ground-resistance is high. Experience has shown such ground resistance does not remain constant. Test should be made at least once a year. A resistance to ground of 5 ohms or less is highly desirable.

Moisture

The absorption of a relatively small amount of moisture by the insulation of electrical equipment will often set up hazardous conditions that may cause a serious failure. Therefore, all possible precautions should be taken to keep the windings of electrical apparatus dry.

The study of failures listed included synchronous motors located in many industries where, due to the nature of operation, large amounts of water are used, and the high frequency of failures due to moisture is attributed to carelessness in handling water for process or wash-up purposes.

In some cases streams of water were allowed to play directly on the motors through sheer carelessness. In others, the clean-up personnel had not been advised, and did not understand, that even the spray rebounding from the floor when washing around a motor can be the cause of a winding burnout. Protection against accidents due to carelessness, such as the cases cited, will depend on conditions in the individual plant, and possible means of prevention would include personnel training and proper shielding of the equipment.

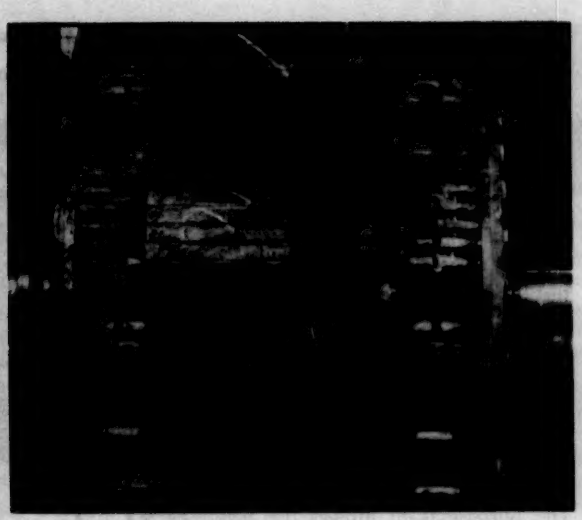
A number of motors failed as a result of the damp atmosphere which surrounded them in poorly ventilated areas where leakage from the packing glands of driven machines, condensate equipment and other apparatus gave off vapors which kept the air continually moist. A few failures were caused by water which dripped through holes in the flooring above the motors. Correction of accident-producing conditions such as these is usually a rather simple matter of carefully planned and properly supervised preventive maintenance.

Approximately 25 percent of the failures from excessive moisture were caused by allowing the motors to stand idle for a sufficient time to absorb moisture. Such periods of time vary, of course, depending on relative temperatures and the quantity of moisture present in the surrounding atmosphere. The best means of prevention is to maintain the temperature of the idle motor a few degrees above that of the surrounding atmosphere, thus keeping moisture from condensing on the windings. Where current is available, it has been the Company's experience that the best method for accomplishing the purpose is by the use of self-contained space heaters. Heated air may also be blown over the windings to keep them dry, but this requires a special heating device for raising the temperature and a blower to circulate the air. In some cases, light bulbs will supply sufficient heat if the motor is covered with a tarpaulin vented at the top to permit proper circulation of the heated air. However, when any of such methods are used, precautions should be taken against damage by fire.

Deterioration of Insulation

The large percentage of losses due to deterioration of insulation results from causes incident to age and operating conditions. On too many occasions a motor is continued in service beyond the normal anticipated life period of its windings until finally it fails in operation and causes not only a property damage loss but also an expensive production loss. Many times this false economy results in severe damage to the laminations as well as burned out windings. This sort of occurrence often prolongs the shutdown by making necessary the

Cross section of shaft fractured by sudden stoppage of driven machine



Typical amortisseur winding burnout caused by improper operation

replacement of the laminations or possibly the entire motor.

Electrical failure of the insulation is generally preceded by the mechanical breakdown of the insulation. Many such failures can be prevented by thorough examinations of the condition of the windings by men who are trained to know the weak points and who can recognize the symptoms of impending failure.

The importance of recognizing the early indications of deteriorated insulation cannot be over-emphasized. If management were to adopt an inspection program that would forewarn them of the impending failure of electrical machines they could in many cases change operating schedules or otherwise make available sufficient time to rewind the equipment with little loss of output. Neglecting to do this however, may lead to long shutdowns of vital equipment at most inopportune times.

Foreign Material

Preventive maintenance will prevent failures resulting from foreign material accumulating on the windings, and it is believed that shutdowns from this cause should be regarded as inexcusable. Serious accumulations of cement, dust, flour, lint, oil, grease and other substances can be prevented by periodic cleaning at regular intervals. In cases where such maintenance will not suffice, enclosures provided with a proper supply of clean, cooling air may have to be used. Isolation in pressurized rooms is sometimes required in extreme cases. More frequently however, the trouble can be corrected at the source and the cause can thus be eliminated.

Defective Material And/Or Poor Workmanship

Most losses due to defective material and/or poor workmanship are a direct result of emphasis placed on quantity production. Such losses should decrease with generally improving conditions in the manufacturers' plants and in those of the ultimate users of the equipment.

Overloading

Failures due to overloading can be reduced, if not entirely eliminated, by insisting that nameplate current values shall not be exceeded. It must be kept in mind that the heating effect varies as the square of the current; hence, even small increases in ampere loads mean relatively large increases in heating.

Lubrication

Failures due to improper lubrication can be materially reduced. The proper oiling or greasing of rotating electrical equipment is a job for a trained man. It should be done where possible with the equipment shut down. The oiler must be made to realize that excessive lubrication can cause failures of ball and roller bearings as does lack of lubrication on all types of bearings.

Field Coils

Many synchronous motors are designed for unity power factor operation and consequently the field coils do not have enough capacity to carry the current required for the degree of power factor correction which may be essential in some cases to avoid power rate penalties. The result of trying to make such motors do more of a job than they are capable of doing is, of course, to "roast out" the field winding.

Unfortunately the nameplates of some of the older motors do not carry the field current rating and therefore the operators are in many cases unknowingly over-exciting the fields. The nameplates on practically all of the present-day synchronous motors carry the field current rating, and there is no justification for over-exciting the field winding of such a motor. In all cases where the rated field current is not known, the manufacturer should be requested to supply the maximum field current value.

Field coils are often equipped with braces between adjacent coil sides to hold the coils in shape and to prevent the turns from bulging outwardly from the poles. It is most important that field coils be carefully wound and properly treated to preserve their original shape and to avoid damage that would be brought about by distortion caused by centrifugal force.

We find many cases where the sides of the coils are bulged out to such an extent that the turns on one coil are in contact with those of the adjacent coil. Such distortion permits some of the individual turns to loosen and chafe and ultimately to become shorted. Distortion of this nature is of a progressive character and it is very important that such trouble be detected when it begins to develop, so that the proper corrective measures may be taken before a failure occurs.

If there are any indications of field coil trouble, such as high temperature, looseness of pole pieces, or brittle insulation, the voltage drop across each individual field coil should be carefully determined to

ascertain whether or not any of the coils have shorted turns, and the drops across the individual coils should compare favorably with one another. Field coils with shorted turns should be promptly replaced.

A good preventive maintenance program should include taking the voltage drop across each individual field coil, using a low reading d.c. voltmeter or bridge, at regular intervals.

Field Discharge Resistors

If originally supplied with the controls by the manufacturer, a field discharge resistor is a most important protective device that is placed into the circuit across the collector rings whenever the field switch is opened. The purpose is to protect the field against induced voltages that would otherwise be produced in the field circuit, often leading to insulation breakdown, particularly of the lead coils. These devices are often found improperly connected and thus ineffective. Even though properly connected, they should be periodically checked for open circuit and general conditions.

Because a discharge resistor is a protective device for the field winding, and because an improper value will affect the motor starting characteristics, the replacement of a defective discharge resistor should be done only in accordance with the manufacturer's specifications.

Amortisseur Windings

Eighty percent of the failures of amortisseur windings that showed up in the study were caused either by loss of excitation or improper operation (too frequent starts, jogging, etc.). In either instance the winding was being abused.

An amortisseur winding is designed to function as a squirrel cage rotor winding in starting a synchronous motor as an induction motor. It does not have the thermal capacity to absorb, nor the radiation surface sufficient to dissipate, the heat generated in it when loss of excitation or improper operation results in synchronous motor continuing to operate as an induction motor.

Correct Brush Pressure Needed for Motors

Correct brush pressure is important in the proper functioning of synchronous motors. Of equal importance is the material of which the brush is made. It must be neither so soft that it wears away too rapidly, nor so hard that it wears or scores the collector ring.

General Precautions

Some other important considerations that should receive attention to secure efficient and trouble-free operation of synchronous motors are summarized as follows:

1. The location selected should be reasonably cool and removed from dirty areas. There should be sufficient space to facilitate repairs and overhauls.

2. Each day inspect for cleanliness, excessive temperatures, vibration, loose foundation bolts, unsual noises, etc. Check surroundings for any leakage of pipes, drains, packing glands, etc. and see if any boards, covers, canvas, hand tools, etc. are left about that might interfere with ventilation or jam moving parts.

3. At each scheduled plant shutdown for maintenance, clean, check air gaps and insulation resistance to ground. Repair or replace parts as conditions observed warrant. When a synchronous motor is being returned to service after a shutdown, or is being placed in service for the first time, it is important that the equipment be placed in service by, or under the direct supervision of, a capable member of the electrical department.

4. At intervals motors should be disassembled, cleaned and carefully inspected. When required, the windings should be given a coat of insulating varnish.

Nuclear Reactor to Aid in Research On Packaging Products and Materials

THE Continental Can Company has joined seven other companies in the construction and operation of a nuclear reactor which Continental will devote to research on the development of new, improved products and materials in the packaging field. Production and use of certain isotopes and experimentation in the irradiation of packaging materials and foods will be available when the reactor is completed in late 1956 or early 1957.

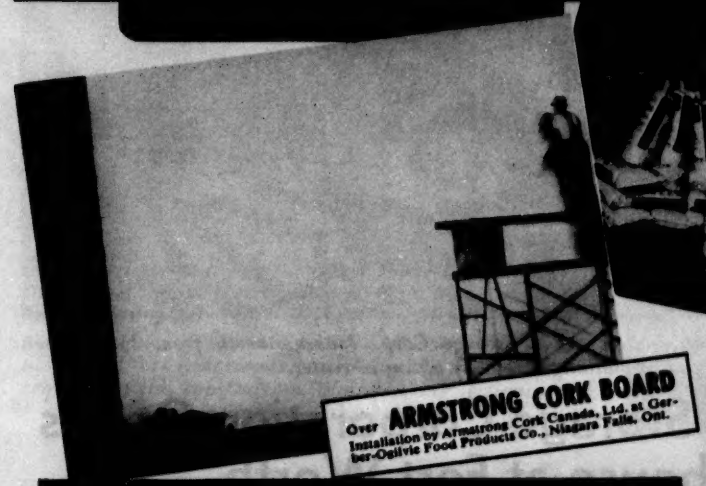
The Industrial Reactor Laboratories, as the facility will be called, will be located on a 250-acre tract either in New Jersey or New York. It will cost between one and one-half million and two million dollars. The reactor will be constructed by AMF Atomics, Inc.

Operation of the laboratories will be directed by a leading university, according to a policy set down by the board of directors, composed of representatives of the various companies.

The seven participating companies are: AFM Atomics Inc., subsidiary of American Machine & Foundry; American Tobacco Company; Corning Glass Works; International Nickel Company; Chas. Pfizer & Company; Socony Mobil-Oil Company; United States Rubber Company.

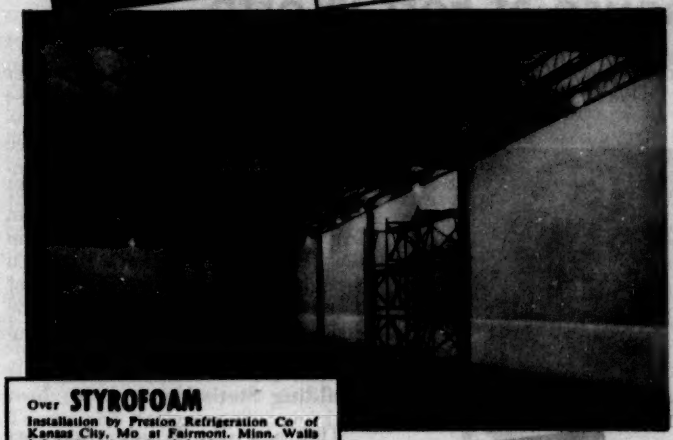
An artist's cutaway conception of the proposed nuclear reactor which will be owned and operated by eight leading American industries, including Continental Can Company.

COATINGS FOR ALL INSULATIONS

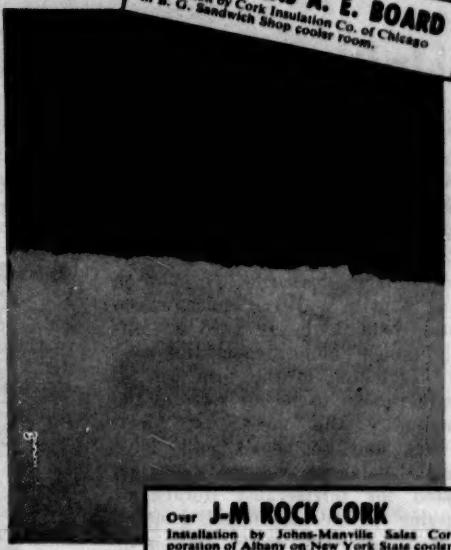


Over **ARMSTRONG CORK BOARD**
Installation by Armstrong Cork Canada, Ltd. at Gerber-Ogilvie Food Products Co., Niagara Falls, Ont.

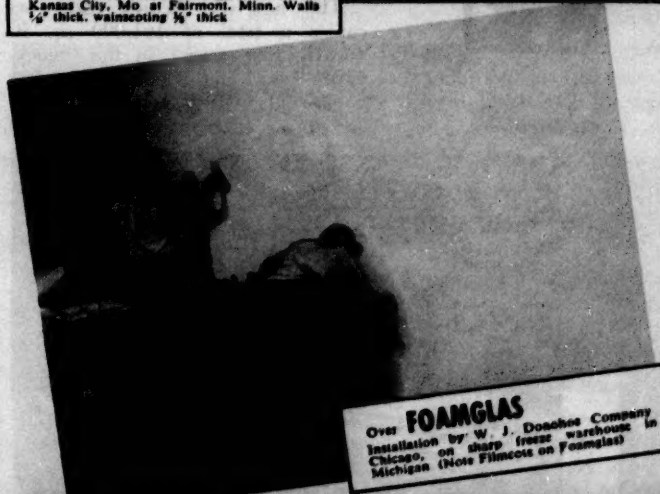
Over **FIBERGLAS A. E. BOARD**
Installation by Cork Insulation Co. of Chicago in B. G. Sandwich Shop cooler room.



Over **STYROFOAM**
Installation by Preston Refrigeration Co of Kansas City, Mo at Fairmont, Minn. Walls 1½" thick. wainscoting ½" thick



Over **J-M ROCK CORK**
Installation by Johns-Manville Sales Corporation of Albany on New York State cooler.



Over **FOAMGLAS**
Installation by W. J. Donohoe Company Chicago, on sharp freeze warehouse in Michigan (Note Filmcote on Foamglas)

- Specified for Largest Plants.
- Applied in one coat. Applications can be made down to —10°F.
- White. 80% light reflectivity.
- Extremely light weight.
- Non-combustible. Listed by Underwriters' Laboratories, Inc.
- Stocked in carload supply by Warehouse Distributors in San Francisco, Los Angeles, Houston, Dallas, Portland, Ore., Atlanta, New Orleans, Newark, N. J., Oklahoma City. (Territories available).

Available through insulation contractors or from factory.

FREE SAMPLES

Truck dock of new Fort Worth warehouse United States Cold Storage Corp., looking north from 23rd. street. Tenant offices are in end of building, company offices in center.

United States Cold Storage Corporation Opens New Warehouse at Fort Worth

SEVENTH in a growing list of modern cold storages, the U. S. Cold Storage Corp. plant at Ft. Worth has just completed a highly successful first quarter. Opened on June 9, with a Texas chuck wagon outing held in the 49 x 95 ft. "air-conditioned" boning room, this newest installation of the firm has already proven to be an asset to the community and the State. Meat, poultry and condensed milk have been the largest volume items accepted for refrigerated storage or freezing, as the case might demand.

With regard to room pattern or plan arrangement and the refrigeration machinery, the Ft. Worth installation is a replica of the Omaha, Nebr., plant constructed and placed in operation late in 1952 (see ICE AND REFRIGERATION, November 1952, page 37). One improvement noted in the construction of this plant over the Omaha installation was the use of pre-stressed concrete beams giving clear or column-free storage areas. This feature alone has increased the revenue earning floor space at Ft. Worth by better than five percent. Some improvements in the lighting facilities have also been brought about through the use of 440 volt distribution throughout the plant to 120-volt lighting transformers at specific areas of use.

R. T. Mackenzie, vice-president and manager, U. S. Cold Storage Corp., Texas Division.

Building Statistics

The new Ft. Worth plant occupies a total of 161,000 sq. ft. (nearly four acres) in the "Stockyards Area" of this rapidly growing Southwestern City. Actual cold storage area available amounts to 75,000

Fig. 1 — Cooler room with evaporated milk in store at U. S. Cold Storage plant at Fort Worth.

Fig. 2 — Air photo of U. S. Cold Storage, strategically located plant at Fort Worth.

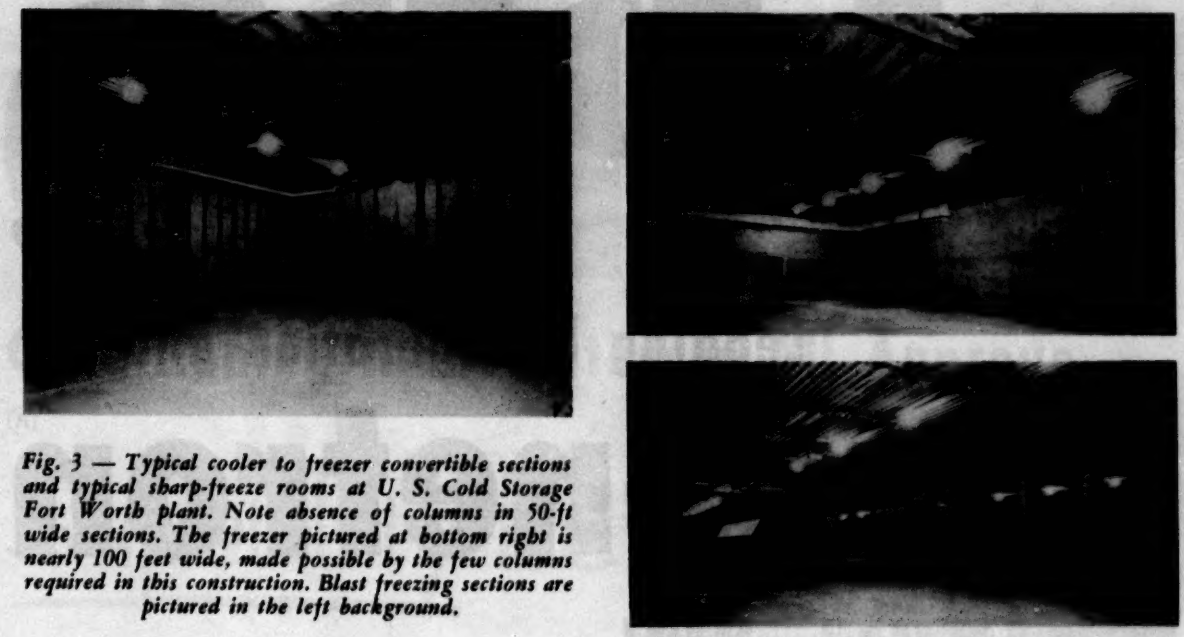


Fig. 3 — Typical cooler to freezer convertible sections and typical sharp-freeze rooms at U. S. Cold Storage Fort Worth plant. Note absence of columns in 50-ft wide sections. The freezer pictured at bottom right is nearly 100 feet wide, made possible by the few columns required in this construction. Blast freezing sections are pictured in the left background.

sq. ft. (20 million pounds), and revenue earning dry storage space is 46,000 sq. ft. (15 million pounds, approximately). Overall dimensions of the building are 230 x 700 ft., and it is divided into 13 sections consisting of five freezers, one cooler, two convertible freezers to coolers, four dry areas and one meat boning section. Typical sections, dock to dock, are 49 ft. x 190 ft. (see Fig. 1). Room ceiling heights are 21 ft, and 16 ft. clear area under the refrigerant coils. Traffic, receiving and shipping docks are 20 ft. in width.

The building is served by 13 railroad car spots, from the Atchison, Topeka and Santa Fe. This car dock is totally enclosed and the roof insulated. At the opposite side of the building is a truck dock, also enclosed and insulated, which will accommodate 54 vehicles. The width of the truck courtyard which parallels long side of the building is 80 ft., allowing ample space for approach to loading facilities.

Material handling equipment consists of six 2-ton low-lift electric jacks for 4-ft. lifts. Lift trucks are powered by Exide batteries and the charging station is equipped with two heavy-duty Hertner chargers. The plant is also equipped with four 1-ton Hi-Lift electric trucks capable of 12 ft. lifts. The latter are powered with Edison batteries and the charging station is equipped with four Lincoln motor-generator chargers. Over 10,000 36 x 48 in. oak pallets were on hand for the start of operations at Ft. Worth.

This Texas plant is capable of freezing 150,000 pounds of foodstuffs per day in minus 10 to minus 15 still air of the low temperature spaces. Two of the freezers, however, are equipped with blast-freezer cabinets, three per room, each capable of holding 16 pallets of merchandise for a total additional capacity of 100,000 pounds per day.

Company personnel at opening of new U. S. Cold Storage Fort Worth plant. Left to right around table: P. R. Cates, secretary-treasurer; J. G. Robertson, director public relations; J. C. Irwin, vice-president, engineering; R. T. Mackenzie, vice-president, Texas; E. E. Hesse, president; E. M. Dodds, chairman of board; W. F. Leimert, president Tranin Egg Products; R. M. Conner, vice-president, Chicago; G. H. Olson, vice-president, Omaha; E. E. Seymour, vice-president, Detroit; R. L. Smith, vice-president, Kansas City; Stan Graner, sales manager, Texas; N. F. Russell, Asst. Secy-Treas.

Building Construction

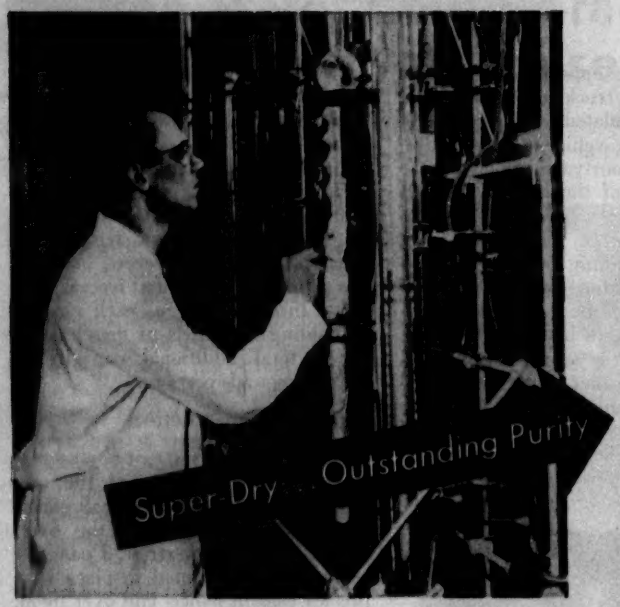
Reinforced concrete structure makes up the skeleton of the new building. Precast concrete wall panels enclose the storage, and the overhead consists of pre-stressed concrete beams set and grouted in place with precast cement panels laid over them. Insulation is Johns-Manville "Rock Cork" with 8 in. applied to the roof and 6 in. thickness applied to concrete walls. Self-sustaining walls between some sections of the building are 6 in. of insulation plastered on both sides.

Floors in the structures are six inches thick reinforced concrete, poured on fill. Aside from a 4 ft. rib-band around the perimeter of the cold areas, there is no insulation in the floor. As mentioned previously, the pre-stressed concrete roof beams which give an unusual width to the storage areas, are believed to be some of the first used in this type of construction in the United States. (An article on this type of building, covering specific details of pre-stressing

APPR

Leading Refrigeration and Air

genetron®



Look at the stringent manufacturing specifications listed here for the principal "Genetrons." Note their exceptionally low moisture content. For example, "Genetron" 12 and "Genetron" 141 are so dry they contain less than ten parts of water per million parts of refrigerant. That's moisture equal to only one thousandth of one percent (0.001%).

The overall purity of "Genetrons" is equally good. See how low they are in non-condensable gases and low boiling impurities. And, remember the quality of current production consistently surpasses even these specifications. No wonder so many leading manufacturers now prefer "Genetrons" as original charge for their equipment!

genetron 12—WHITE LABEL

DICHLORODIFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.05
Non-condensable gases (gases insoluble in perchloroethylene)—vol. % in vapor phase, max.	1.5
Boiling pt. at 760 mm. Hg °F.	−21.6
Boiling range °F (to 85% pt.), max.	0.9

genetron 141—GREEN LABEL

MONOCHLORODIFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0010
Chlorides	none
High boiling impurities—vol. %, max.	0.05
Non-condensable gases (gases insoluble in perchloroethylene)—vol. % in vapor phase, max.	1.5
Boiling pt. at 760 mm. Hg. °F	−41.4
Boiling range °F (to 85% pt.), max.	0.9

genetron 11—ORANGE LABEL

TRICHLOROMONOFLUOROMETHANE

Quality Specifications

Moisture wt. %, max.	0.0015
Chlorides	none
High boiling impurities—vol. %, max.	0.05
Boiling pt. at 760 mm. Hg. °F	74.7
Boiling range °F (to 85% pt.), max.	0.5

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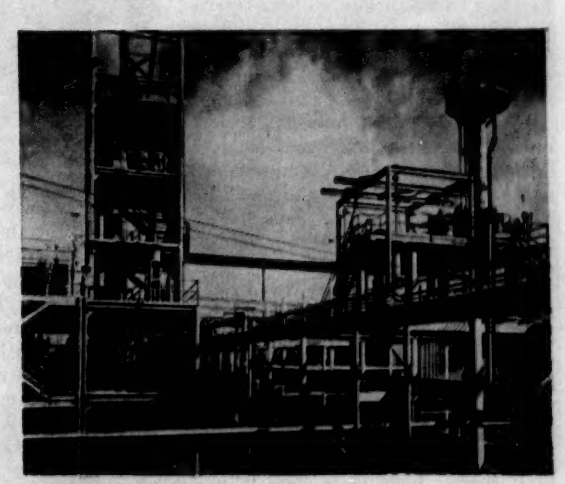
Conditioning Manufacturers All Approve...

Super-Dry Refrigerants

Few products have ever undergone such exhaustive examination as "Genetron" Refrigerants. Leading refrigeration and air conditioning manufacturers have checked and rechecked them intensively . . . proved for themselves that "Genetrons" meet or surpass their most exacting specifications for fluorinated hydrocarbon refrigerants.

Yes . . . in every case . . . "Genetrons" have been certified for the original or replacement charge in America's finest equipment. That's because they have been proved to be—

- Super-Dry—guaranteed exceptionally low moisture content.
- Non-toxic, non-flammable, stable, safe.
- Non-corrosive to standard equipment materials.
- Critical and freezing points well outside range of operating uses.
- Solvent action on oil helps prevent solidification or congealing of lubricant.
- Miscible with oil; aid in lubrication of equipment.
- Identical and interchangeable in all respects with comparable fluorinated hydrocarbon refrigerants produced by any other manufacturer meeting the same high standards.



READY SOON:
In addition to its expanded "Genetron" production center at Baton Rouge, La., General Chemical will soon have large new "Genetron" facilities in operation at Danville, Ill. These, plus others in the industry, assure refrigerant capacity to meet all needs for the foreseeable future.

Basic Chemicals for American Industry

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 Rector Street, New York 6, N. Y.

Allied Chemical

See your refrigeration wholesaler

and the advantages of this construction will be published in next month's issue of this magazine in an article entitled "Pre-stress Warehouse Construction" by Donald W. Kirk.)

Insulation finishes throughout the structure were typical Portland cement finish. All doors are single hung 6 ft. x 9 ft. type with hardwood thresholds. The doors were equipped with finger-tip openers and mounted on steel angles or channels, concealed by the insulation on the cold side. The architect for the structure was Preston M. Geren and the general contractor was Thomas S. Byrne, Inc., both of Ft. Worth.

Refrigeration Machinery

As at Omaha, the Ft. Worth plant is a combination direct expansion and chilled brine refrigeration systems. Standard 2-in. pipe coils are used in each of the refrigerated rooms. Three brine chillers serve the system, providing high, intermediate and low temperature brine requirements. A flooded ammonia system serves the blast freezer coils.

Engine room equipment consists of two 150 hp 6-cylinder and one 100 hp 4-cylinder Carrier compressors; two Fuller FES 125 hp and one 150 hp rotary boosters. The capacity of the plant is rated at 350 tons refrigeration per day.

The brine chillers are by Frick, as are the vertical shell-and-tube condensers, inter-coolers, accumulators and oil still. The plant also is equipped with an Armstrong purger. Water cooling is accomplished in a single-fan induced draft Marley installation of "Transite" and steel. Blast freezer housing is construction of the same material.

Blast freezer coils are by Carrier, and equipped with American Blower Co., vane-axial fans and Phillips float controls. Plant pumps are Union Steam Co. equipment powered by Louis Allis motors. Compressor drives and their control equipment are 720 rpm induction motors by Ideal Electric and Manufacturing Co.

The refrigerating plant is equipped with Frick gauges and dual relief valves. Both Frick and Phillips float control equipment is utilized in the engine room on pressure vessels and chillers. The larger reciprocating compressors are equipped for 1/3 and 2/3 unloading and the smaller unit is equipped for half capacity unloading.

Piping Color Coded

All piping in the plant — ammonia, water, brine, steam, oil, gas, etc. — are color-coded for easy identification by the plant engineers. Although the code is easily recognized as that sponsored by ASRE and ASA, details of the coding is in accordance with that promulgated by the Safety Committee of NARW.

The plant offices are heated through a mechanical ventilating system which is converted during warm months to the use of brine from the plant's refrigerating system for air cooling. The coils are of Admiralty metal and were manufactured by The Trane Co. specifically for this purpose.

Defrosting is accomplished by means of hot brine throughout the house and by means of hot gas in the blast-freezer compartments.

Personnel Highlights

Construction of the plant at Ft. Worth, together with machinery erection was under the supervision of James C. Irwin, vice-president-engineering, U. S. Cold Storage Corp. Operations at the Ft. Worth plant are under the supervision of Ralph T. Mackenzie, vice-president and engineer of the Texas Division of the corporation, which also includes the plants at Dallas and Pt. Lavaca. Stanley Graner is the sales manager for the division and J. D. Sims is the division engineer. Chief engineer of the new Ft. Worth installation is E. J. Bennett.

Opening ceremonies in June included a press luncheon and a local business men's dinner, previews and a regular house warming and reception on June 9. Officers and directors of U. S. Cold Storage Corp. on hand for these events were: E. M. Dodds, chairman of the board and chief executive officer; E. E. Hesse, president; Edward F. Blettner, Jr., vice-president, First National Bank of Chicago; John Dow, executive vice-president, Interstate Bakeries Corp., Kansas City; G. D. Patterson, partner, Winston, Strawn, Black and Towner, Chicago; L. D. Schreiber, L. D. Schreiber & Co., Chicago; Orville Taylor, partner, Taylor, Miller, Busch and Magner, Chicago; W. A. Rosie, assistant manager, Detroit; Dale D. McCutchen, superintendent of the Dallas plant; and L. C. Britt, office manager for Dallas.

New Warehouse Project

A NEW refrigeration plant will be installed in the $2,500,000 warehouse project being completed at Grand Union Company's Waterford food distribution center, Albany, N.Y. The Ballinger Company of Philadelphia are architects and engineers.

Liquid and Frozen Egg Production

LIQUID egg production during May for immediate consumption, drying, and freezing, totaled 84,867,000 pounds, compared with 72,498,000 in May last year, and the 1949-53 average of 91,103,000 pounds. Dried egg (egg solids) production during May totaled 2,913,000 pounds, compared with 3,178,000 pounds during May last year and the average of 7,000,000 pounds. Frozen egg production during May totaled 68,700,000 pounds compared with 55,448,000 pounds in May, last year, and the 1949-53 average of 65,449,000 pounds.

Liquid egg production during June for immediate consumption, dry and freezing, totaled 72,156,000 lbs compared with 56,411,000 lbs in June last year and the 1949-53 average of 65,806,000 lbs the Crop Reporting Board announced. Dried egg (egg solids) production during June totaled 3,292,000 lbs compared with 2,398,000 lbs during June last year and the average of 6,183,000 lbs. Frozen egg production during June totaled 52,912,000 lbs, compared with 44,727,000 lbs in June last year and the 1949-53 average of 42,044,000 lbs.

Liquid egg production during July for immediate consumption, drying and freezing, totaled 36,211,000 pounds, compared with 24,771,000 pounds in July last year and the 1949-53 average of 33,483,000 pounds. Dried eggs (egg solids) production during July totaled 2,643,000 pounds, compared with 1,869,000 pounds in July last year and average of 4,385,000 pounds.

Peanut Skins May Create Spontaneous Combustion

DUE to the high oil content and very active oxidative tendencies of raw peanut skins, warehousemen are warned by The Refrigeration Research Foundation not to store for animal feed such products, as usually packaged and when delivered at warm outside air temperatures, without previous treatment. Strong forced air circulation should be provided about each package, preferably in a freezer, prior to later storage at cooler temperatures, under 40 F., if that is desired. If the product which has a highly insulating nature, is adequately precooled throughout the package, it can then be stored in cooler rooms without subsequent hazard, if protected by stacking with dunnage.

New Grocery Warehouse Includes Freezer Space

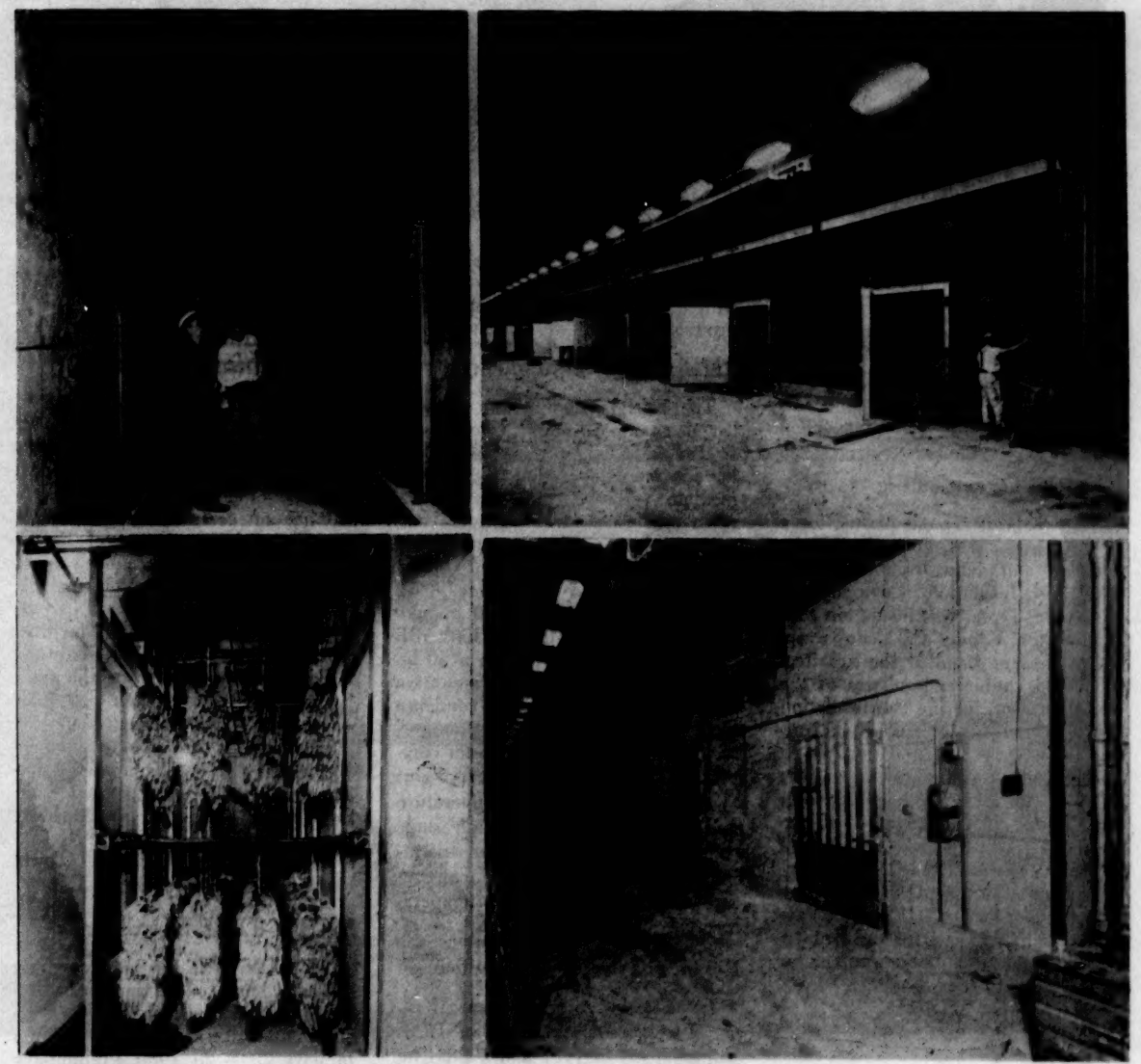
THE increasing demand for frozen foods and more consumption of fresh fruits and vegetables has led to increased planning of freezer and cold storage space in food warehouses. The Kroger Company's new Toledo warehouse, built to serve as a distribution point for about 50 of the firm's retail stores within a 40-mile radius of the city, is an example of this construction trend.

The one-story building includes a total of 166,000 square feet of space of which 8,400 square feet is devoted to freezer and cold storage rooms. Space is also provided for dry grocery storage, a covered truck drive, repair garage and offices. Eleven freezer and cold storage rooms were constructed for a range of temperatures from minus 10 to 76 F.

Freezer Room

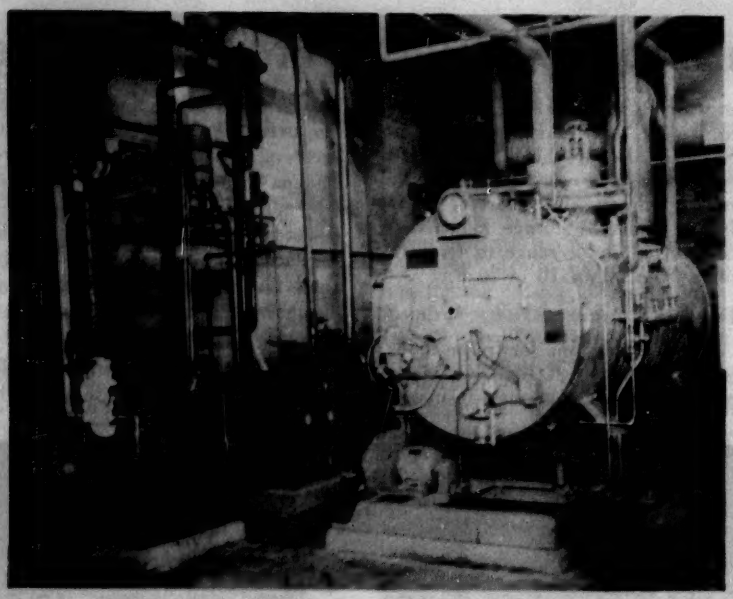
The freezer room, for frozen foods, is 40 x 44 x 13½ ft. high. Six inches of Fiberglas cold storage insulation was installed in the floor, ceiling and the walls to assist in maintaining temperatures at minus 10 F. Three banana rooms 40 x 16 x 13½ ft. and two more 40 x 9 x 13½ ft. are insulated with four inches of Fiberglas insulation in walls and ceiling, with three inches insulation for partitions. Temperatures for these rooms are from 52 F.

Four inches of insulation was installed in walls and ceilings of the



Before and after views. Top left, unfinished banana storage room at new Toledo warehouse of Kroger Company is inspected by Chief Clarence E. Blanchard, Toledo Fire Prevention Bureau and Lloyd E. Blanchard, construction superintendent for insulation contractors. Below, the same room finished and in operation.

Top right, a scratch coat of cement plaster is applied over Fiberglas cold storage insulation. The structure, an example of the most modern type of construction for buildings of this type, is one story with extensive freezer and cooler storage areas. Below, a view of the finished cold storage battery of boxes in operation.



York V W compressing units for the Kroger Toledo warehouse are located near two package type steam generator units in the plant machinery spaces. A fluorinated hydrocarbon refrigerant is used in a two-stage system, together with a small liquid recirculator.

butter, meat, cheese, and wet and dry produce rooms, all of which are 40 x 20 x 13½ ft. and designed for temperatures of 35 to 48 F. Six inches of the same insulation was installed in the floor of a 40 x 60-foot area for a future freezer room.

Cement Plaster Coating

Two coats of cement plaster for a total thickness of ¾-inch, provide the exterior and interior finish coats. Breeding Insulation Company of Knoxville, Tenn., was insulation contractor for Kroger's Toledo warehouse. Kroger handled the architectural and engineering phases of the building, coordinating the insulation details with Breeding's Cincinnati office.

A York refrigeration system was installed for the produce, banana, and freezer rooms. In each of the produce rooms, a York Model IDV air unit was installed with liquid recirculation through the coils. The freezer room has an IDV air unit arranged with float control and flooded coil. Water defrost with an automatic timer is used to remove the frost from the coils.

Banana Rooms

There are in the three full size banana rooms, each, a special Marlo CUA 8.75 air unit; and in the two half size banana rooms, each, a special Marlo CUA 5.9 air unit. These Marlo units are thermal valve fed, with the suction line common to the produce rooms.

Refrigeration Equipment

The refrigeration system was selected as a compound compression system with the produce rooms and banana rooms operation at the intermediate pressure, and the freezer room operation on the booster compressor which discharges into the intercooler. The refrigeration equipment consists of a York Model A432 booster compressor, with 20 hp motor, and a York Model A3069-5BE high stage compressor, with a 50 hp motor. A Model EV8A evaporative condenser was furnished to condense the gas from the high stage compressor. The capacity of the booster compressor is 7.1 tons when operating at minus 17.2 F evaporator temperature and the capacity of the high stage compressor is 41.2 tons when operating at plus 20 F evaporator temperature and 96 F condensing temperature.

Replaces Former Warehouse

The new building replaces a Kroger warehouse constructed in 1923, and enlarged in 1927 and 1928. The Kroger Company founded in 1883 and incorporated in 1902, is the third largest U. S. grocery chain, operating more than 1,600 stores in the middle West and South. Its headquarters are in Cincinnati.

Pamphlet Tells How to Use Refrigerated Space

A NEW pamphlet, graphically illustrating how frozen food manufacturers, meat packers, fresh fruit and vegetable dealers, super markets and other large volume storers of perishable foods can realize more operating capital, lower storage costs, insurance savings, loans on commodities, etc. by using the facilities of public refrigerated warehouses, has just been published by the National Association of Refrigerated Warehouses.

Designed especially for customers of NARW members, the new pamphlet entitled, "Public Refrigerated Warehouses Cut Your Costs, Increase Your Profits, Serve All Your Needs," pinpoints 11 major advantages public refrigerated warehouses offer their customers.

Also, it reveals that 80 per cent of the nation's total commercial freezer space is now contained in public refrigerated warehouses, enough space to provide zero degree protection for frozen commodities anywhere in the United States.

Supplement Added To Warehouse Directory

A SUPPLEMENT to the 1955 Directory of Public Refrigerated Warehouses is available now at no charge to firms using the facilities of refrigerated warehouses for the storage of perishable commodities, the National Association of Refrigerated Warehouses announced today.

The Supplement, which includes plant additions and changes in public refrigerated warehouse facilities listed in the 1955 NARW Directory, is published as a service to the members of NARW and their customers — the perishable foods trade — to bring them up to date on changes within the public refrigerated warehouse industry. All requests for the Supplement should be addressed to the National Association of Refrigerated Warehouses, 1210 Tower Building, Washington 5, D. C.

NARW-TRRF Seminar

AN ADVANCE seminar, covering vital phases of refrigerated warehouse operations will be held at Purdue University, Lafayette, Indiana January 22 — 26, 1956. Preliminary planning indicates that this year's training course will be the best yet. Top instructors, well known authorities in their fields, are being lined up now. Full details will be announced later.

THERMO EXPANSION VALVES

TYPE 402 with pressure limiting feature

TYPE TK "3 valves in 1"

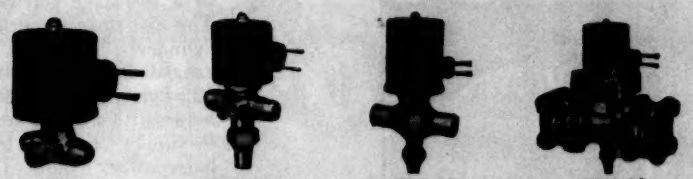
TYPE TCL with angle connections

TYPE TCL with straight-thru connections

TYPE TR Multi-Outlet

For automatic control of liquid refrigerant on all types of refrigeration and air conditioning systems. Capacities: from fractional tonnage to 220 tons Freon 12, 350 tons Freon-22; selective charges. Low temperature valves for −40°F to −100°F.

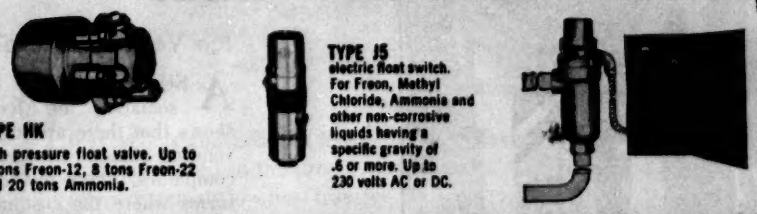
SOLENOID VALVES



TYPE S1 **TYPE S2** **TYPE M3** **TYPE R2**

For all types of service. For liquid: Freon-12 up to 75 tons; 110 tons Freon-22. For suction: Freon-12 up to 10 tons; 15 tons Freon-22. For brine, water, steam, hot gas discharge, air and oil.

FLOAT VALVES AND SWITCHES

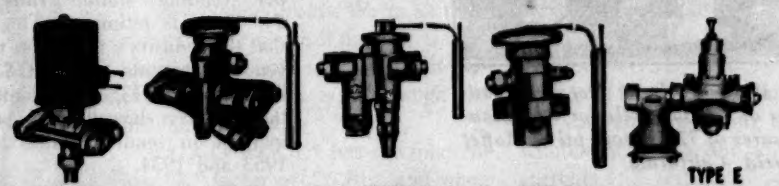


TYPE HK high pressure float valve. Up to 5 tons Freon-12, 8 tons Freon-22 and 20 tons Ammonia.

TYPE J5 electric float switch. For Freon, Methyl Chloride, Ammonia and other non-corrosive liquids having a specific gravity of .6 or more. Up to 230 volts AC or DC.

908 LECTRO-LEVEL electronic remote control of liquid level. Accurate control for full-flooded evaporators. Adjustable to a wide range of level changes. Easy-to-set control dials conveniently mounted in remote box.

AMMONIA CONTROLS



TYPE M81F **TYPE TG** **TYPE UG** **TYPE TX** **TYPE E** with strainer

Solenoid Liquid Valves — up to 172 tons. Solenoid Suction Valves — up to 28 tons. Thermo Expansion Valves — from fractional tonnage to 125 tons. Automatic Expansion Valves — from fractional tonnage to 60 tons.

SUCTION LINE CONTROLS

TYPE EPR EVAPORATOR PRESSURE REGULATORS For all refrigerants, with connection sizes up to 6"

TYPES 771-772 SUCTION PRESSURE REGULATORS (Hold-Back Valves) Prevent motor overload. Freon-12, Freon-22.

TYPE 760 "EVAPOTROL" Pressure regulator — ½ ton, Freon-12 — ¾ ton, Methyl Chloride.

the complete line of refrigerant controls

ALCO ALSO OFFERS YOU
Constant Pressure (Automatic) Expansion Valves — Reversing Valves — Liquid and Suction Line Strainers.

For capacities in excess of those listed, write us and give specific requirements.
SEE YOUR ALCO WHOLESALER

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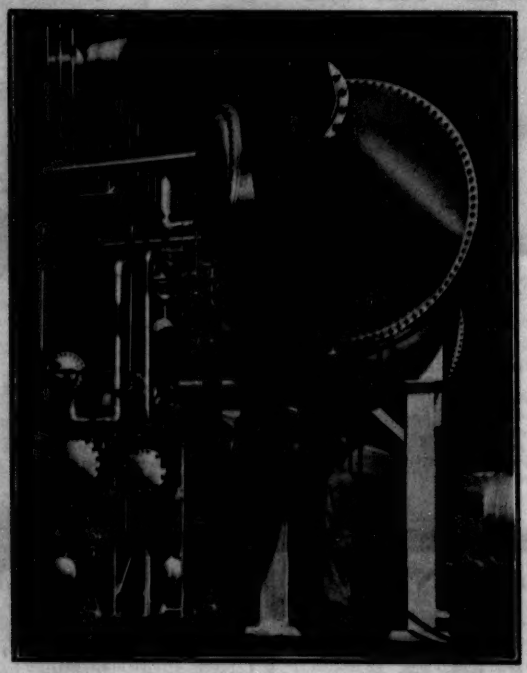
Wind Tunnel Cooled and Humidified Tests Airplanes for High Speed

SINCE the advent of the jet engine, airplanes have been flying at faster and faster speeds. For testing airplanes to operate near and above the speed of sound, the National Advisory Committee for Aeronautics, the U. S. Air Force, U. S. Navy, numerous aircraft and engine manufacturing plants and universities operate a wide variety of wind tunnels.



Eighty seven-inch shell, nearly 25 feet long, containing 22 sections of cooling coils for conditioning air under pressures of 72 or more psi at Moffet Field, California.

To obtain an air flow at supersonic speeds in these tunnels, so much energy must be expended that the airstream becomes heated. Refrigeration is then applied to reduce the temperature. In one of the largest of these wind tunnels, operated by the NACA at its Ames Aeronautical Laboratory near San Francisco, California, supersonic speeds are achieved by an axial-flow compressor driven by two motors totaling 60,000 horsepower. The tips of the blades of such a compressor travel at speeds close to the speed of sound.

Two alternative methods are being used in wind-tunnel testing in an effort to hold down fan or compressor speeds and the attendant heating effect. One is to compress the air within the tunnel to 100 or more pounds per square inch. This increase in density produces test results equivalent to those which would be obtained by testing a much larger model at atmospheric pressures. Another method is to inject into the airstream a quantity of Freon, which is, of course, much heavier than air.

For the Ames Aeronautical Laboratory operated by the National Advisory Committee for Aeronautics at Moffett Field near San Francisco, Frick Company furnished about two years ago a large shell in which compressed air could be cooled and its humidity controlled. The success of this led to the construction of a still larger shell, 87 inches in diameter and nearly 25 feet long, capable of withstanding higher air pressures and arranged with a complete air conditioning system inside.

Cooling Coils

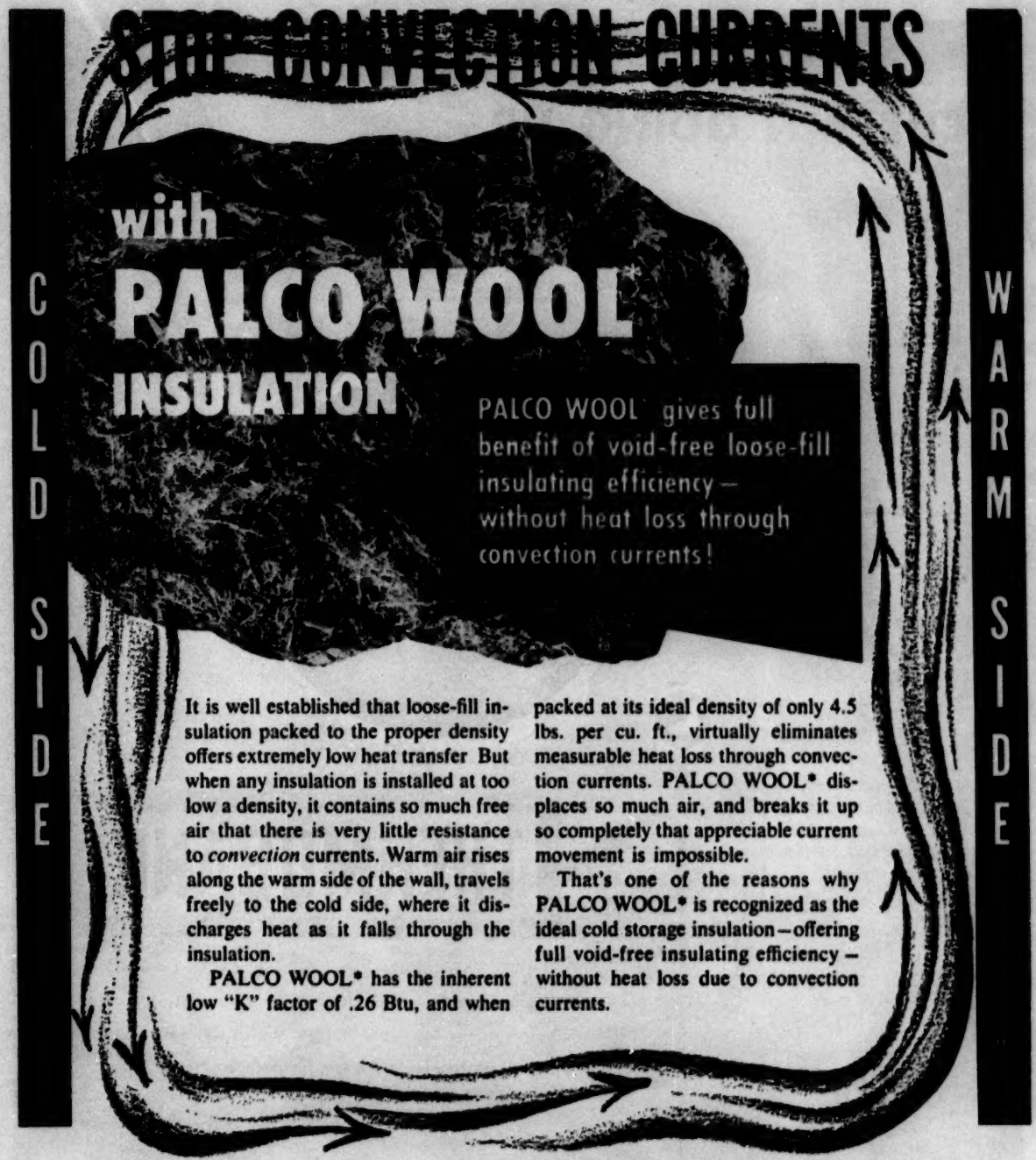
There are no less than 22 sections of cooling coils, which are connected to a two-stage refrigerating system. The first stage comprises a pair of 6-cylinder "Eclipse" machines arranged in duplex with a motor of 125 horsepower and 900 rpm placed between them. The second stage is a 9-cylinder "Eclipse" belted to a 100-horsepower motor. Two "Eclipse"-type condensers handle Freon-12, one serving as an intercooler between stages.

Two-stage installation of Frick "Eclipse" compressors for cooling compressed air used in wind tunnel tests, simulating speeds of 5,000 mph, at Ames Aeronautical Laboratories, Moffett Field.

Ice Vending Increases

A SURVEY by the National Association of Ice Industries shows that there are about 8,000 ice vending stations in operation by ice companies. These include plant platforms where the customer is served by a vending mechanism, as well as vending stations located away from the plant. The average annual sales per vending station runs about $4,000, it is estimated. This means that the industry's total sales through vendors amounts to about $32 million annually. Figures submitted by the industry showed a 13 per cent increase in vending outlets between 1953 and 1954.

STOP CONVECTION CURRENTS



with PALCO WOOL* INSULATION

PALCO WOOL gives full benefit of void-free loose-fill insulating efficiency — without heat loss through convection currents!

It is well established that loose-fill insulation packed to the proper density offers extremely low heat transfer But when any insulation is installed at too low a density, it contains so much free air that there is very little resistance to *convection* currents. Warm air rises along the warm side of the wall, travels freely to the cold side, where it discharges heat as it falls through the insulation.

PALCO WOOL* has the inherent low "K" factor of .26 Btu, and when packed at its ideal density of only 4.5 lbs. per cu. ft., virtually eliminates measurable heat loss through convection currents. PALCO WOOL* displaces so much air, and breaks it up so completely that appreciable current movement is impossible.

That's one of the reasons why PALCO WOOL* is recognized as the ideal cold storage insulation—offering full void-free insulating efficiency — without heat loss due to convection currents.

Send for these aids to Better Cold Storage Insulation

THE PACIFIC LUMBER COMPANY

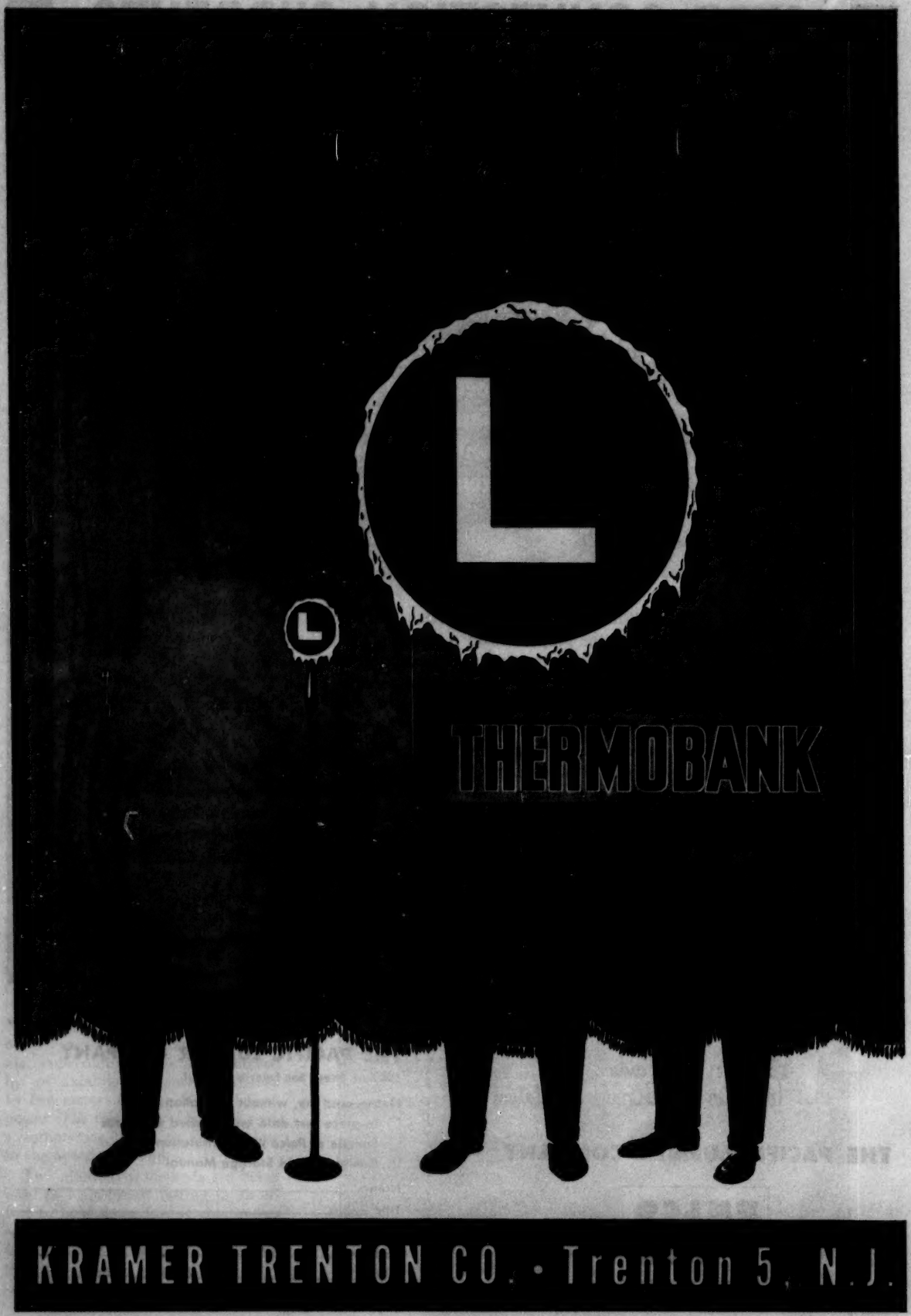
PALCO INSULATION WOOL®

100 BUSH STREET, SAN FRANCISCO 4, CALIFORNIA

THE PACIFIC LUMBER COMPANY
100 Bush Street, San Francisco 4, Calif.

Please send me, without obligation:
- ☐ In-place test data on insulated structures
- ☐ Sample of Palco Wool* Insulation
- ☐ Complete Cold Storage Manual

Name_____
Title_____
Company_____
Address_____
City_____ Zone____ State_____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THERMOBANK
KRAMER TRENTON CO. • Trenton 5, N.J.

Buyers Guide

Product Classification

REFER TO PAGE 44 FOR COMPLETE ADDRESSES

REFER TO PAGE 41 FOR TRADE NAMES

ABRASIVE EQUIPMENT, TRAPS, SEPARATORS, BLAST CABINETS, ETC., (See Pressure Vessels)

ACCESSORIES & EQUIPMENT

ASPHALT AND ASPHALT COMPOUNDS (See Coatings, Cements and Compounds)

AVIGATORS (See Survey Systems and Accessories)

AUTOMATIC CONTROL DEVICES (See Controls By Types)

BAGS, BIN

BARRIERS, GUARDS

BEARINGS, BALL AND ROLLER

BEARINGS, SLEEVE

BELTS AND BELTING

BLAST MACHINES (See Freezing Systems)

BLOWERS AND FANS (See Fans)

BRAKES (See Welding Equipment)

BURR GRINDERS (See Appliances)

BRINE COOLERS AND CHILLERS

Aaco Industries, Inc., Jackson, Mich.
Aircraft Production Engineers, Chicago, Ill.
California Steel Products Div. of Adsco Industries, Inc., Richmond, Calif.
Dean Products, Inc., Brooklyn, N. Y.
Doyle & Roth Mfg. Co., Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div. Montreal, Que., Canada.
Howe Ice Machine Co., Chicago, Ill.
Kennard Corp., St. Louis, Mo.
Niagara Blower Co., New York, N. Y.
Remy Products Co., Canton 2, Ohio.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
Whitlock Mfg. Co., West Hartford, Conn.
Wolf Condenser Works, Brooklyn, N. Y.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

BRINE PUMPS (See Pumps By Types)

BRINE SPRAYING SYSTEMS

Aircraft Production Engineers, Chicago, Ill.
Chip Ice Corp., Chicago, Ill.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div. Montreal, Que., Canada.
York Corp., York, Pa.

BRINE TANKS

Aircraft Production Engineers, Chicago, Ill.
Augusta Iron & Steel Works, Inc., Augusta, Ga.
California Steel Products Div. of Adsco Industries, Inc., Richmond, Calif.
Doyle & Roth Mfg. Co., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
Whitlock Mfg. Co., West Hartford, Conn.
York Corp., York, Pa.

BRINE TREATMENT (See Water & Brine Treatment)

CALCIUM CHLORIDE

Barada & Page, Inc., Kansas City, Mo.
Columbia Southern Chemical Corp., Pittsburgh, Pa.
Dow Chemical Co., Midland, Mich.
Solvay Process Division, Allied Chemical & Dye Corp., New York, N. Y.
Wyandotte Chemicals Corp., Wyandotte, Mich.

CAPACITORS (See Electrical Line Equipment)

CARBON DIOXIDE REFRIGERATING SYSTEMS AND COLLECTORS

Detroit Ice Machine Co., Detroit, Mich.
Frick Co., Waynesboro, Pa.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

CARBON DIOXIDE, SOLID CARBONIC ACID REFRIGERATING SYSTEMS

Frick Co., Waynesboro, Pa.

CHARGING LINES

Dole Refrigerating Co., Chicago, Ill.
Flexible Tubing Corp., Guilford, Conn.
Flexonics Corp., Maywood, Ill.
Henry Valve Co., Melrose Park, Ill.
Ilsa Engineering & Sales Co., Oklahoma City, Okla.
York Corp., York, Pa.

CHILLERS AND COOLERS

Aaco Industries, Inc., Jackson, Mich.
American Coils Co., Newark, N. J.
Carrier Corp., Syracuse, N. Y.
Chip Ice Corp., Chicago, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Dean Products Inc., Brooklyn, N. Y.
Dole Refrigerating Co., Chicago, Ill.
Downingtown Iron Works, Inc., Div. of Pressed Steel Tank Co., Downingtown, Pa.
Doyle & Roth Mfg. Co. Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Gar Engineering Corp., Los Angeles, Calif.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div. Montreal, Que., Canada.
Howe Ice Machine Co., Chicago, Ill.
Kennard Corp., St. Louis, Mo.
King Co., Owatonna, Minn.
McQuay, Inc., Minneapolis, Minn.
Majestic Bros. Co., Chicago, Ill.
Remy Products Co., Canton, Ohio.
Schmieding, Inc., Evansville, Ind.
Temprite Products Corp., Birmingham, Mich.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
J. E. Watkins Co., Maywood, Ill.
Whitlock Mfg. Co., West Hartford, Conn.
Wolf Condenser Works, Brooklyn, N. Y.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COATINGS, CEMENTS AND COMPOUNDS

Anaconda Sales Corp., Los Angeles, Calif.
Anaconda Wire & Cable Co., New York, N. Y.
Anchor Packing Co., Philadelphia, Pa.
Armstrong Cork Co., Lancaster, Pa.
Asbestos Products Co., Chicago, Ill.
Bakelite Corp., New York, N. Y.
Barrett Co., New York, N. Y.
Bird & Son, Inc., East Walpole, Mass.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brunswick-Balke-Collender Co., Chicago, Ill.
Carey Co., Philip, Lockland, Cincinnati, Ohio.
Celotex Corp., Chicago, Ill.
Certain-teed Products Corp., New York, N. Y.
Chicago Metal Hose Corp., Maywood, Ill.
Connecticut Hard Rubber Co., New Haven, Conn.
Crane Co., Chicago, Ill.
Dearborn Chemical Co., Chicago, Ill.
Detrex Corp., Detroit, Mich.
Dewey & Almy Chemical Co., Cambridge, Mass.
Dixon Corp., Joseph, Jersey City, N. J.
Dow Corning Corp., Midland, Mich.
Durametallic Corp., Kalamazoo, Mich.
Eagle-Picher Sales Co., Cincinnati, Ohio.
Flexitallic Gasket Co., Chicago, Ill.
Flintkote Co., New York, N. Y.
Garlock Packing Co., Palmyra, N. Y.
General Electric Co., Schenectady, N. Y.
General Tire & Rubber Co., Akron, Ohio.
Gits Bros. Mfg. Co., Chicago, Ill.
Goodall Rubber Co., Trenton, N. J.
Goodrich Co., B. F., Akron, Ohio.
Goodyear Tire & Rubber Co., Akron, Ohio.
Graphite Metallizing Corp., Yonkers, N. Y.
Hewitt Rubber Corp., Buffalo, N. Y.
Hood Rubber Co., Watertown, Mass.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio.
Insulation Corp. of America, Jersey City, N. J.
Johns-Manville Sales Corp., New York, N. Y.
Kaylo Co., Owens-Illinois Glass Co., Toledo, Ohio.
Kearney & Trecker Corp., Milwaukee, Wis.
Kerite Co., New York, N. Y.
Keystone Asbestos Co., Philadelphia, Pa.
Lewis Co., Edward H., Detroit, Mich.
Mahon Co., R. C., Detroit, Mich.
Mall Tool Co., Chicago, Ill.
Mathieson Alkali Works, Inc., New York, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Monsanto Chemical Co., St. Louis, Mo.
National Carbon Co., Inc., New York, N. Y.
National Cork Co., Inc., Englewood, N. J.
National Lead Co., New York, N. Y.
Nopco Chemical Co., Harrison, N. J.
Norton Co., Worcester, Mass.
Oakite Products, Inc., New York, N. Y.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Pabco Products, Inc., San Francisco, Calif.
Parker Appliance Co., Cleveland, Ohio.
Pecora Paint Co., Philadelphia, Pa.
Permacel Tape Corp., New Brunswick, N. J.
Pittsburgh Corning Corp., Pittsburgh, Pa.
Plastic Materials & Polymers, Inc., Chicago, Ill.
Plastic Products Co., Cleveland, Ohio.
Plymouth Rubber Co., Canton, Mass.
Polymer Corp., Reading, Pa.
Prentiss Co., Inc., Clinton, Mass.
Republic Rubber Div., Lee Rubber & Tire Corp., Youngstown, Ohio.
Resistoflex Corp., Roseland, N. J.
Rockbestos Products Corp., New Haven, Conn.
Rubber Corp. of America, Passaic, N. J.
Russell Mfg. Co., Middletown, Conn.
Sauereisen Cements Co., Pittsburgh, Pa.
Schjeldahl Co., G. T., Northfield, Minn.
Shell Chemical Corp., San Francisco, Calif.
Stanley Chemical Co., East Berlin, Pa.
Stebbins Engineering & Mfg. Co., Watertown, N. Y.
Stillman Rubber Co., New Haven, Conn.
Thermoid Co., Trenton, N. J.
Tremco Mfg. Co., Cleveland, Ohio.
Tuthill Spring Co., Chicago, Ill.
Union Carbide & Carbon Corp., New York, N. Y.
United States Gasket Co., Camden, N. J.
United States Rubber Co., New York, N. Y.
Universal Atlas Cement Co., New York, N. Y.
Virginia Chemicals Inc., Portsmouth, Va.
Wallace & Tiernan Co., Inc., Belleville, N. J.
Wellman Co., S. K., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh, Pa.
Wilmington Chemical Corp., Wilmington, Del.
Worthington Corp., Harrison, N. J.

COILS, BENDS AND BAFFLE ASSEMBLIES

Bush Mfg. Co., West Hartford, Conn.
California Steel Prod. Div. of Adsco Industries Inc., Richmond, Calif.
Chicago Ripple Mfg. Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
J. E. Hall, Ltd., Linde-Hall Canadian Refr. Div. Montreal, Que., Canada.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
Rempe Co., Chicago, Ill.
Rossing Mfg. Co., Pittsburgh, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
Whitlock Mfg. Co., West Hartford, Conn.
York Corp., York, Pa.

COILS, BLOWER UNITS

Advanced Engineering Corp., Milwaukee, Wis.
Aircraft Production Engineers, Chicago, Ill.
American Blower Corp., Detroit, Mich.
Baltimore Air Coil Co. Inc., Baltimore, Md.
Bush Mfg. Co., West Hartford, Conn.
Carrier Corp., Syracuse, N. Y.
Dole Refrigerating Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Kennard Corp., St. Louis, Mo.
King Co., Owatonna, Minn.
Kramer Trenton Co., Trenton, N. J.
McQuay Inc., Minneapolis, Minn.
Majestic Bros. Co., Chicago, Ill.
Rempe Co., Chicago, Ill.
Refrigeration Engineering Inc., Los Angeles, Calif.
Rightbilt, Inc., Chicago, Ill.
Trane Co., LaCrosse, Wis.
York Corp., York, Pa.
Young Radiator Co., Racine, Wis.

COILS, FIN

Aircraft Production Engineers, Chicago, Ill.
American Blower Corp., Detroit, Mich.
The Bush Mfg. Co., West Hartford, Conn.
California Steel Products Div. of Adsco Industries, Inc., Richmond, Calif.
Detroit Ice Machine Co., Detroit, Mich.
Frick Co., Waynesboro, Pa.
The G & O Manufacturing Co., New Haven, Conn.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div., Montreal, Que., Can.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Kennard Corp., St. Louis, Mo.
Kramer Trenton Co., Trenton, N. J.
McQuay, Inc., Minneapolis, Minn.
Remy Products Co., Canton, Ohio.
Rempe Co., Chicago, Ill.
Rightbilt, Inc., Chicago, Ill.
Slant-Fin Radiator Corp., Richmond Hill 18, N. Y.
Trane Co., LaCrosse, Wis.
U.S. Thermo Controls Co., Minneapolis, Minn.
The Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.
Young Radiator Co., Racine, Wis.

COILS, PLATE

American Blower Corp., Detroit, Mich.
Dean Products, Inc., Brooklyn, N. Y.
Dole Refrigerating Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Trane Co., LaCrosse, Wis.
Tranter Mfg. Inc., Lansing, Mich.

COIN DEVICES

National Rejectors Co., Inc., St. Louis, Mo.

COLD STORAGE DOORS (See Doors, Cold Storage)

COLD STORAGE INSULATION (See Insulation)

COMPOUNDS, CORROSION INHIBITING (See Water Treating Materials)

COMPRESSOR PARTS AND ACCESSORIES

Frick Co., Waynesboro, Pa.
J. E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div. Montreal, Que., Can.
Howe Ice Machine Co., Chicago, Ill.
Hubbell Corp., Montclair, Ill.
Lufkin Division Westinghouse Air Brake Co., Milwaukee, Wis.
Lipman Div., Yates American Machine Co., Beloit, Wis.
Trane Co., LaCrosse, Wis.
The Vilter Mfg. Co., Milwaukee, Wis.
J. H. H. Voss Co. Inc., New York, N. Y.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COMPRESSORS, AIR, GAS, ETC.

American Blower Corp., Detroit, Mich.
Carrier Corp., Syracuse, N. Y.
Johnson Service Co., Milwaukee, Wis.
Lufkin Division Westinghouse Air Brake Co., Milwaukee, Wis.
Nash Engineering Co., South Norwalk, Conn.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COMPRESSORS, AIR FOR ICE MAKING

Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COMPRESSORS, BOOSTER, (Also Refer to Compressor Types Below)

Aircraft Production Engineers, Chicago, Ill.
The Creamery Package Mfg. Co., Chicago, Ill.
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div., Montreal, Que., Can.
Howe Ice Machine Co., Chicago, Ill.
Lufkin Division Westinghouse Air Brake Co., Milwaukee, Wis.
The Vilter Mfg. Co., Milwaukee, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COMPRESSORS, REFRIGERATING, CARBON DIOXIDE (See Carbon Dioxide Systems)

COMPRESSORS, REFRIGERATING, CENTRIFUGAL

American Blower Corp., Detroit, Mich.
Carrier Corp., Syracuse, N. Y.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div., Montreal, Que., Can.
Trane Co., LaCrosse, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COMPRESSORS, REFRIGERATING, RECIPROCATING

Aircraft Production Engineers, Chicago, Ill.
Carrier Corp., Syracuse, N. Y.
Creamery Package Mfg. Co., Chicago, Ill.
Dorsch, Sessomis & Mauert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refr. Div., Montreal, Que., Can.
Howe Ice Machine Co., Chicago, Ill.
Lipman Div., Yates American Machine Co., Beloit, Wis.
Schmieding, Inc., Evansville, Ind.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

COMPRESSORS, REFRIGERATING, ROTARY

Freezing Equipment Sales, Inc., York, Pa.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

CONDENSER PARTS AND ACCESSORIES

Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div. Montreal, Que., Can.
Hubbell Corp., Montclair, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

CONDENSERS, AIR COOLED

Aircraft Production Engineers, Chicago, Ill.
American Coils Co., Newark, N. J.

Bush Mfg. Co., West Hartford, Conn.
Carrier Corp., Syracuse, N. Y.
Frick Co., Waynesboro, Pa.
Kennard Corp., St. Louis, Mo.
Kramer Trenton Co., Trenton, N. J.
McQuay, Inc., Minneapolis, Minn.
Refrigeration Engineering Inc., Los Angeles, Calif.
Trane Co., LaCrosse, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

CONDENSERS, ATMOSPHERIC

Aircraft Production Engineers, Chicago, Ill.
Frick Co., Waynesboro, Pa.
Refrigeration Engineering Inc., Los Angeles, Calif.
Trane Co., LaCrosse, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

CONDENSERS, CARBON DIOXIDE (See also Solid Carbonic Acid Refrigerating Systems)

California Steel Products Div. of Adco Industries, Inc., Richmond, Calif.
Youngstown Iron Works, Inc., Div. of Pressed Steel Tank Co., Youngstown, Pa.
Frick Co., Waynesboro, Pa.
York Corp., York, Pa.

CONDENSERS, COMBINATION AIR AND WATER COOLED

Henry Vogt Machine Co., Louisville, Ky.
York Corp., York, Pa.

CONDENSERS, EVAPORATIVE

Acme Industries, Inc., Jackson, Mich.
Aircraft Production Engineers, Chicago, Ill.
Baltimore Aircoil Co., Inc., Baltimore, Md.
Bush Mfg. Co., West Hartford, Conn.
Carrier Corp., Syracuse, N. Y.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div., Montreal, Que., Can.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
Industrial Refrigeration Co., Inc., Atlanta, Ga.
Kennard Corp., St. Louis, Mo.
Kramer Trenton Co., Trenton, N. J.
Niagara Blower Co., New York, N. Y.
McQuay, Inc., Minneapolis, Minn.
Majonnier Bros. Co., Chicago, Ill.
Refrigeration Engineering, Inc., Los Angeles, Calif.
Trane Co., LaCrosse, Wis.
J. E. Watkins Co., Maywood, Ill.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

CONDENSERS, SHELL AND COIL, SHELL AND TUBE, AND SPECIAL

Acme Industries, Inc., Jackson, Mich.
Aircraft Production Engineers, Chicago, Ill.
California Steel Products Div. of Adco Industries, Inc., Richmond, Calif.
Carrier Corp., Syracuse, N. Y.
Dorsch, Gosewin & Nevert, Inc., Chicago, Ill.
Youngstown Iron Works, Inc., Div. of Pressed Steel Tank Co., Youngstown, Pa.
Doyle & Roth Mfg. Co., Inc., Brooklyn, N. Y.
Elliott Co., Jeanette, Pa.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div., Montreal, Que., Can.
Howe Ice Machine Co., Chicago, Ill.
Kemp Co., Chicago, Ill.
Keasbey Mfg. Co., Sharpsburg, Pittsburgh, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
J. E. Watkins Co., Maywood, Ill.
Whitlock Mfg. Co., West Hartford, Conn.
Wolfe Condenser Works, Brooklyn, N. Y.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.
Young Radiator Co., Racine, Wis.

CONDENSERS, WATER REGULATING VALVE

Bailey Meter Co., Cleveland, Ohio.
Hubbell Corp., Mundelein, Ill.
Refrigerating Specialties Co., Chicago, Ill.
York Corp., York, Pa.

CONTINUOUS FREEZERS (See Freezing Systems)

CONTROL LIQUID LEVEL (See also Liquid Return Systems)

Alco Valve Co., St. Louis, Mo.
Bailey Meter Co., Cleveland, Ohio.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
Creamery Package Mfg. Co., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
General Controls Co., Glendale, Calif.
Hubbell Corp., Mundelein, Ill.
Johnson Service Co., Milwaukee, Wis.
Leeds and Northrup Co., Philadelphia, Pa.
Manning, Maxwell & Moore Inc., Stratford, Conn.
Mason-Neilan Regulator Co., Norwood, Mass.
Marcold Corp., Chicago, Ill.
Penn Instrument Div., Burgess-Manning Co., Philadelphia, Pa.
Ray Engineering & Sales Co., Oklahoma City, Okla.
Sporlan Valve Co., St. Louis, Mo.
Uehling Instrument Co., Paterson, N. J.
Vilter Manufacturing Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
York Corp., York, Pa.

CONTROLS, FLOAT SWITCHES

Alco Valve Co., St. Louis, Mo.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
Clark Controller Co., Cleveland, Ohio
Hubbell Corp., Mundelein, Ill.
Marcold Corp., Chicago, Ill.
Majonnier Bros. Co., Chicago, Ill.

CONTROLS, FLOAT VALVES

Alco Valve Co., St. Louis, Mo.
Armstrong Machine Works, Three Rivers, Mich.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
Creamery Package Mfg. Co., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
Hubbell Corp., Mundelein, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Marcold Corp., Chicago, Ill.
H. A. Phillips & Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Trane Co., LaCrosse, Wis.
York Corp, York, Pa.

CONTROLS, HUMIDITY (See Humidifying and Dehumidifying Systems)

CONTROLS, MOTOR (See Motor Controls and Starters)

CONTROLS, PRESSURE ACTUATED

AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Co., Decatur, Ill.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Central Engineering & Supply Co., Dallas, Texas
Clark Controller Co., Cleveland, Ohio.
Dorsch, Gosewin & Nevert, Inc., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
General Controls Co., Glendale, Calif.
Hubbell Corp., Mundelein, Ill.
Johnson Service Co., Milwaukee, Wis.
James P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Marcold Corp., Chicago, Ill.
Penn Instrument Division, Burgess-Manning Co., Philadelphia, Pa.
Powers Regulator Co., Skokie, Ill.
Refrigerating Specialties Co., Chicago, Ill.
York Corp., York, Pa.

CONTROLS, SUCTION PRESSURE ACTUATED

Alco Valve Co., St. Louis, Mo.
AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Dorsch, Gosewin & Nevert, Inc., Chicago, Ill.
Hubbell Corp., Mundelein, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Marcold Corp., Chicago, Ill.
Refrigerating Specialties Co., Chicago, Ill.
U. S. Thermo Controls Co., Minneapolis, Minn.
York Corp., York, Pa.

CONTROLS, TEMPERATURE ACTUATED (See Expansion Valves)

CONVEYORS AND COMPONENTS

K. G. Brown Mfg. Co., Inc., Mattituck, N. Y.
Food Machinery & Chemical Corp., San Jose, Calif.
Gennett & Sons, Inc., Richmond, Ind.
Gifford-Wood Co., Hudson, N. Y.
Hendrick-Hershey of Indiana, Inc., Lebanon, Ind.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jaffrey Manufacturing Co., Columbus, Ohio
Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
John H. Matthews & Sons, No. Arlington, N. J.
Majonnier Bros. Co., Chicago, Ill.
The Rapids-Standard Co., Inc., Grand Rapids, Mich.
Refrigeration Engineering Co., Minneapolis, Minn.
Ton-Tex Corp., Grand Rapids, Mich.

COOLERS, BRINE (See Brine Coolers and Chillers)

COOLING TOWERS

Acme Industries, Inc., Jackson, Mich.
Binks Manufacturing Co., Chicago, Ill.
Bush Mfg. Co., West Hartford, Conn.
Carrier Corp., Syracuse, N. Y.
Flour Corp., Ltd., Los Angeles, Calif.
Frick Co., Waynesboro, Pa.
Hansen Structural Steel Co., Kansas City, Mo.
Kennard Corp., St. Louis, Mo.
Kramer Trenton Co., Trenton, N. J.
Lilie-Hoffman Cooling Towers, Inc., St. Louis, Mo.
Marley Co., Kansas City, Mo.
McQuay, Inc., Minneapolis, Minn.
J. F. Pritchard & Co. of California, Kansas City, Mo.
Refrigeration Engineering Inc., Los Angeles, Calif.
Water Cooling Corp., New York, N. Y.
Water Cooling Equipment Co., St. Louis, Mo.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

CORK INSULATION PRODUCTS (See Insulation)

CORROSION CONTROL (See Protective Coatings)

COUPLINGS (See Drives)

CRANES AND HOISTS

Detroit Hoist and Machine Co., Detroit, Mich.
Frick Co., Waynesboro, Pa.
Harnischfeger Corp., Milwaukee, Wis.
Hyster Company, Portland, Oregon
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Lewis-Shepard Products, Inc., Watertown, Mass.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Manning, Maxwell & Moore, Inc., Muskegon, Mich.
Stanley E. Morris Co., Los Angeles, Calif.
Robbins & Myers, Inc., Springfield, Ohio
Silent Hoist and Crane Co., Brooklyn, N. Y.
York Corp., York, Pa.

CRANKSHAFTS (See Compressor Parts and Accessories)

CREAMERY AND DAIRY MACHINERY (See Dairy Equipment)

DAIRY EQUIPMENT

Creamery Package Mfg. Co., Chicago, Ill.
Dole Refrigerating Co., Chicago, Ill.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Majonnier Bros. Co., Chicago, Ill.
York Corp., York, Pa.

DAMPER MOTORS AND REGULATORS

Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
A. W. Cash Co., Decatur, Ill.
Johnson Service Co., Milwaukee, Wis.
Partlow Corp., New Hartford, N. Y.
Powers Regulator Co., Skokie, Ill.
Ruggles-Klingeman Mfg. Co., Salem, Mass.
York Corp., York, Pa.

DEAERATING SYSTEMS

Elgin Softener Corp., Elgin, Ill.
Elliott Co., Jeanette, Pa.
Permutit Co., New York, N. Y.
Worthington Corp., Harrison, N. J.

DEEP WELL PUMPS (See Pumps, Deep Well)

DEFROSTING SYSTEMS

Aircraft Production Engineers, Chicago, Ill.
Bush Mfg. Co., West Hartford, Conn.
Dole Refrigerating Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Hubbell Corp., Mundelein, Ill.
Kramer Trenton Co., Trenton, N. J.
Niagara Blower Co., New York, N. Y.
J. E. Watkins Co., Maywood, Ill.
York Corp., York, Pa.

DEHUMIDIFYING SYSTEMS (See Also Humidifying Systems)

Advanced Engineering Corp., Milwaukee, Wis.
Carrier Corp., Syracuse, N. Y.
Columbia Southern Chemical Corp., Pittsburgh, Pa.
Dryomatic Corpn., Alexandria, Va.
Frick Co., Waynesboro, Pa.
Niagara Blower Co., New York, N. Y.
J. F. Pritchard & Co. of California, Kansas City, Mo.
Refrigerating Specialties Co., Chicago, Ill.
Trane Co., LaCrosse, Wis.
Worthington Corp., Harrison, N. J.
Wyandotte Chemical Corp., Wyandotte, Mich.
York Corp., York, Pa.

DEHYDRANTS

Allis Mfg. Co., Chicago, Ill.
AP Controls Corp., Milwaukee, Wis.
Ansul Chemical Co., Marinette, Wis.
Barnsbay-Cheney Co., Columbus, Ohio
Columbia Southern Chemical Corp., Pittsburgh, Pa.
Henry Valve Co., Melrose Park, Ill.
Sporlan Valve Co., St. Louis, Mo.
Superior Valve Co., Pittsburgh, Pa.
Wyandotte Chemical Corp., Wyandotte, Mich.

DEIONIZING EQUIPMENT (See Descaling Systems)

DESICCANTS (See Dehydrants)

DE-SUPERHEATERS, REFRIGERANTS

Bay Engineering & Sales Co., Clearance City, Ohio.
Schutte & Koerting Co., Cornwells Heights, Pa.
Whitlock Mfg. Co., West Hartford, Conn.
Worthington Corp., Harrison, N. J.

DIESEL ENGINES

Caterpillar Tractor Co., Peoria, Ill.
Detroit Diesel Engine Div., General Motors Corp., Detroit, Mich.
Fairbanks, Morse & Co., Chicago, Ill.
Harnischfeger Corp., Milwaukee, Wis.
Hercules Motors Corp., Canton, Ohio
R. H. Sheppard Co., Inc., Hanover, Pa.
Worthington Corp., Harrison, N. J.

DIFFUSERS, AIR (See Grilles)

DISCS, COMPRESSOR VALVES (See Compressor Parts and Accessories)

DISTRIBUTORS, CONDENSER WATER (See Condenser Accessories)

DOOR ACCESSORIES AND HARDWARE, COLD STORAGE

Armstrong Cork Co., Lancaster, Pa.
Bolt-Lox Corp., Seattle, Wash.
Chase Cold Storage Door Co., Reading, Pa.
Dunbar Bay Refrigerator Door Co., Harvard, Ill.
Kramer Products Co., Kansas City, Mo.
Jamison Cold Storage Door Co., Hagerstown, Md.
Schwitzer Mfg. Co., Madison, Wis.
Sylvester Products Corp., Fairfield, Iowa
York Corp., York, Pa.

DOOR GASKETS, COLD STORAGE

Dunbar Bay Refrigerator Door Co., Harvard, Ill.
Kramer Products Co., Kansas City, Mo.
Chase Cold Storage Door Co., Reading, Pa.
Curtain Packing Co., Palmyra, N. Y.
E. G. Haubach & Sons, St. Louis, Mo.
Jamison Cold Storage Door Co., Hagerstown, Md.
John H. Merrett, Inc., St. Albans, N. Y.
Sylvester Products Corp., Fairfield, Iowa
York Corp., York, Pa.

DOORS, COLD STORAGE

Armstrong Cork Co., Lancaster, Pa.
Dunbar Bay Refrigerator Door Co., Harvard, Ill.
Dunbar Engineering Co., Montclair, N. J.
Chase Cold Storage Door Co., Reading, Pa.
Clark Door Co., Inc., Hanover, N. J.
Nashville Mfg. Corp., Grand Rapids, Mich.
Jamison Cold Storage Door Co., Hagerstown, Md.
Mundet Cork Corp., North Bergen, N. J.
Refrigeration Engineering Co., Minneapolis, Minn.
Sylvester Products Corp., Fairfield, Iowa
York Corp., York, Pa.

DOORS, FIREPROOF

York Corp., York, Pa.

DRIERS (See Dehydrants)

DRINKING WATER COOLING PLANTS

Bass Products, Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Remy Products Co., Clinton, Ohio
Water Treatment Engineering, Cleveland, Ohio
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

DRIP PANS (See Pans, Drip)

DRIVES & COUPLINGS

American Blower Corp., Detroit, Mich.
Bailey Meter Co., Cleveland, Ohio
Bantam, Inc., Royal Oak, Mich.
Clark Controller Co., Cleveland, Ohio
Electric Machinery Mfg. Co., Minneapolis, Minn.
Frick Co., Waynesboro, Pa.
Jeffrey Mfg. Co., Columbus, Ohio
Kennedy Co., Inc., Pittsburgh, Pa.
Link-Belt Co., Chicago, Ill.
Morse Mfg. Corp., Chicago, Ill.
Reliance Electric & Engineering Co., Cleveland, Ohio
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

DRIVES, CHAIN (See Conveyors and Components)

DRYING EQUIPMENT, AIR OR GASEOUS PHASE

Ansul Chemical Co., Marinette, Wis.

DUCT ACCESSORIES AND FITTINGS, PREFABRICATED DUCTWORK

Flexible Tubing Corp., Guilford, Conn.
Minnesota Adhesives Corp., New York, N. Y.
Goodloe E. Moore, Inc., Danville, Ill.
E. H. O'Neill Piece Co., Chicago, Ill.
York Corp., York, Pa.

DUCT INSULATION AND LINING (See Insulation)

ECONOMIZERS, AMMONIA

Doyle & Roth Mfg. Co., Inc., Brooklyn, N. Y.
Henry Vogt Machine Co., Chicago, Ill.
York Corp., York, Pa.

EJECTORS (See also Steam Jet Vacuum Cooling Systems)

Elliott Co., Jeannette, Pa.
Manning, Maxwell & Moore Inc., Stratford, Conn.
Schutte & Koerting Co., Cornwells Heights, Pa.
Worthington Corp., Harrison, N. J.

ELECTRIC GENERATING PLANTS, DIESEL OR GASOLINE DRIVEN (See also Motor Generator Sets)

Caterpillar Tractor Co., Peoria, Ill.
Detroit Diesel Engine Div., General Motors Corp., Detroit, Mich.
Fairbanks, Morse & Co., Chicago, Ill.
Harnischfeger Corp., Milwaukee, Wis.
Hallett Mfg. Co., Inglewood, Calif.
Ideal Electric & Mfg. Co., Mansfield, Ohio
R. H. Sheppard Co., Inc., Hanover, Pa.

ELECTRIC HEATER ELEMENTS (See Heater Elements)

ELECTRIC HOISTS (See Cranes & Hoists)

ELECTRICAL LINE EQUIPMENT

Alrocco Mfg. Co., Inc., Pittsburgh, Pa.
Clark Controller Co., Cleveland, Ohio
Columbus Electric Mfg. Co., Cleveland, Ohio
Hastings Instrument Co., Hampton, Va.
Jeffrey Mfg. Co., Columbus, Ohio
Link Belt Co., Chicago, Ill.
Marion Electrical Instrument Co., Manchester, N. H.
Miracle Adhesives Corp., New York, N. Y.
York Corp., York, Pa.

ELEVATORS

Barrett-Cravens Co., Northbrook, Ill.
Gifford-Wood Co., Hudson, N. Y.
John H. Matteson & Sons, Mt. Arlington, N. J.
Montgomery Elevator Co., Moline, Ill.
Rowlester Co., North Bergen, N. J.
Rotary Lift Co., Memphis, Tenn.

ENGINES, DIESEL AND ACCESSORIES

Allis-Chalmers, Buda Division, Harvey, Ill.
Caterpillar Tractor Co., Peoria, Ill.
Continental Motors Corp., Muskegon, Mich.
Detroit Diesel Engine Div., General Motors Corp., Detroit, Mich.
Fairbanks, Morse & Co., Chicago, Ill.
Hallett Mfg. Co., Inglewood, Calif.
Harnischfeger Corp., Milwaukee, Wis.
Hercules Motors Corp., Canton, Ohio
R. H. Sheppard Co., Inc., Hanover, Pa.
Worthington Corp., Harrison, N. J.

ENGINES, GAS AND GASOLINE AND ACCESSORIES

Allis-Chalmers, Buda Division, Harvey, Ill.
Continental Motors Corp., Muskegon, Mich.
Fairbanks, Morse & Co., Chicago, Ill.
Hercules Motors Corp., Canton, Ohio
Lamb Division, Westinghouse Air Brake Co., Milwaukee, Wis.
Worthington Corp., Harrison, N. J.

ENGINES, STEAM

York Corp., York, Pa.

EVAPORATIVE COOLERS AND ACCESSORIES

Aircraft Production Engineers, Chicago, Ill.
Baltimore Aircoil Co., Inc., Baltimore, Md.
The Bush Mfg. Co., West Hartford, Conn.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Lindo-Hall Canadian Refrigeration Div., Montreal, Que., Can.
Niagara Blower Co., New York, N. Y.
The Trane Co., LaCrosse, Wis.
J. E. Watkins Co., Maywood, Ill.
Worthington Corp., Harrison, N. J.
The Whitlock Mfg. Co., West Hartford, Conn.
Young Radiator Co., Racine, Wis.

EVAPORATORS (See Coils, Blower Units, etc.)

EXPANSION VALVES

Alco Valve Co., St. Louis, Mo.
AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
A. W. Cash Co., Decatur, Ill.
Detroit Controls Corp., Detroit, Mich.
Frick Co., Waynesboro, Pa.
General Controls Co., Glendale, Calif.
Henry Valve Co., Melrose Park, Ill.
Hydrol Corp., Kankakee, Ill.
Johnson Service Co., Milwaukee, Wis.
Penn Instrument Div., Sargent-Manning Co., Philadelphia, Pa.
Powers Regulator Co., Skokie, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Sporlan Valve Co., St. Louis, Mo.
Henry Vogt Machine Co., Louisville, Ky.
York Corp., York, Pa.

FANS

Alrocco Mfg. Co., Inc., Pittsburgh, Pa.
American Blower Corp., Detroit, Mich.
Chicago Blower Corp., Franklin Park, Ill.
Clarage Fan Co., Kalamazoo, Mich.
Jeffrey Manufacturing Co., Columbus, Ohio
The King Company, Centerville, Minn.
Massey Mfg. Corp., Chicago, Ill.
Niagara Blower Co., New York, N. Y.
J. F. Pritchard & Co. of California, Kansas City, Mo.
Reynolds Electric Co., River Grove, Ill.
Robbins & Myers, Inc., Springfield, Ohio
Roots Connersville Blower Div., Connersville, Ind.
Trane Co., LaCrosse, Wis.
United States Hoffman Corp., New York, N. Y.
York Corp., York, Pa.

FELT, WATERPROOF (See Insulation)

FIBERGLAS (See Insulation)

FILTERS, AIR

Bendix-Cheney Co., Columbus, Ohio
Mason-Neilan Regulator Co., Norwood, Mass.
Research Products Corp., Madison, Wis.
York Corp., York, Pa.

FILTERS, MAGNETIC

Nashville-Hershey of Indiana, Inc., Lebanon, Ind.

FILTERS, OIL, WATER

AP Controls Corp., Milwaukee, Wis.
Elgin Softener Corp., Elgin, Ill.
Hankins Chemical Co., Los Angeles, Calif.
Nashville-Hershey of Indiana, Inc., Lebanon, Ind.
Permutit Co., New York, N. Y.

FILTERS, REFRIGERANT

Ansul Chemical Co., Marinette, Wis.
AP Controls Corp., Milwaukee, Wis.
Henry Valve Co., Melrose Park, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Sporlan Valve Co., St. Louis, Mo.
Superior Valve & Fittings Co., Pittsburgh, Pa.

FILTRATION EQUIPMENT

Elgin Softener Corp., Elgin, Ill.
Nashville-Hershey of Indiana, Inc., Lebanon, Ind.
Schutte & Koerting Co., Cornwells Heights, Pa.

FINNED COILS (See Coils, Fin)

FINISHES

Amercoat Corp., Southgate, Calif.
Barreled Sunlight Paint Co., Providence, Rhode Island
Bartson Corp., Chemical Div., New York, N. Y.
Grand Rapids Varnish Corp., Grand Rapids, Mich.
Alfred Hague & Co., Inc., Brooklyn, N. Y.
Koppers Co., Inc., Pittsburgh, Pa.
E. H. O'Neill Piece Co., Chicago, Ill.
Quigley Co., Inc., New York N. Y.
Sherwin-Williams Co., Cleveland, Ohio
Stoncrete Mfg. Co., St. Louis, Mo.
Tropical Paint Co., Cleveland, Ohio
Tuferoid Co., Inc., Des Moines, Ia.
Wilbur & Williams Co., Brighton, Boston, Mass.

FIRE PROTECTION EQUIPMENT

Ansul Chemical Co., Marinette, Wis.
Clark Controller Co., Cleveland, Ohio
Columbia Southern Chemical Corp., Pittsburgh, Pa.
Walter Kidde & Co., Inc., Belleville, N. J.
Water Cooling Corp., New York, N. Y.
Wyandotte Chemical Corp., Wyandotte, Mich.

FITTINGS, AMMONIA

Aircraft Production Engineers, Chicago, Ill.
Automatic Switch Co., Orange, N. J.
Dorsch, Sammis & Bauch, Inc., Chicago, Ill.
Dole Refrigerating Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Lindo-Hall Canadian Refrigeration Div., Montreal, Que.
Henry Valve Co., Melrose Park, Ill.
Hydrol Corp., Kankakee, Ill.
Ladish Co., Cudahy, Wis.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
York Corp., York, Pa.

FITTINGS, ELECTRICAL (See Electrical Line Equipment)

FITTINGS, HOSE

Band-It Company, Denver, Colo.
Flexible Tubing Corp., Guilford, Conn.
Rex Engineering & Sales Co., Oklahoma City, Okla.

FITTINGS, REFRIGERANT

Aircraft Production Engineers, Chicago, Ill.
A. M. Byers Co., Pittsburgh, Pa.
Dole Refrigerating Co., Chicago, Ill.
Dorsch, Gassaway & Newart, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div., Montreal, Que. Canada
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Ladish Co., Cudahy, Milwaukee, Wis.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Henry Vogt Machine Co., Louisville, Ky.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

FLAKE ICE MACHINES (See Ice Making Machines)

FLEXIBLE CONNECTIONS (See Charging Lines)

FLEXIBLE COUPLINGS (See Drives and Couplings)

FLOATS, CONTROLS, SWITCHES (See Controls).

FLOAT VALVES (See Controls, Float Valves)

FLOORING MATERIALS

Mahogany Importing Co., Los Angeles, Calif.
E. N. O'Neill Floors Co., Cicero, Ill.
Permanite Corp., Chicago, Ill.
Sheleote Mfg. Co., St. Louis, Mo.
Tuforete Co., Inc., Des Moines, Iowa
United States Steel Co., Pittsburgh, Pa.

FLOW CONTROLS (See Regulators, Flow)

FOIL, METALLIC

Alpha Metals, Inc., Jersey City, N. J.

FOOD FREEZING EQUIPMENT (See Freezers etc.)

FOOD PROCESSING MACHINERY

Creamery Package Mfg. Co., Chicago, Ill.
Food Machinery & Chemical Corp., San Jose, Calif.
Jeffrey Mfg. Co., Columbus, Ohio
Majonnier Bros. Co., Chicago, Ill.
Reynolds Electric Co., River Grove, Ill.

FORK LIFT TRUCKS (See also Materials Handling Equipment)

Allis-Chalmers, Buda Division, Harvey, Ill.
Automatic Transportation Co., Chicago, Ill.
Barrett-Cravens Co., Northbrook, Ill.
Hyster Co., Portland, Oreg.
Lewis-Shepard Products, Inc., Watertown, Mass.
Mercury Mfg. Co., Chicago, Ill.
Moto-Truc Co., Cleveland, Ohio
Pulton, Inc., New York City, N. Y.
Revelvator Co., North Bergen, N. J.
Silent Hoist and Crane Co., Brooklyn, N. Y.

FREEZER DOORS (See Doors, Cold Storage)

Advanced Engineering Corp., Milwaukee, Wis.
Aircraft Production Engineers, Chicago, Ill.
American Plate Freezer Corp., E. Boston, Mass.
Belt-Ice Corp., Seattle, Wash.
Carrier Corp., Syracuse, N. Y.
Chip Ice Corp., Chicago, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Dean Products, Inc., Brooklyn, N. Y.
Dole Refrigerating Co., Chicago, Ill.

FREEZERS, BATCH, BLAST, CONTINUOUS, PACKAGE, QUICK, SHARP, TUNNEL, PORTABLE

Food Machinery & Chemical Corp., San Jose, Calif.
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Ref. Div., Montreal, Que. Can.
Howe Ice Machine Co., Chicago, Ill.
Industrial Mfg. & Engineering Co., Chicago, Ill.
King Company, Owosso, Mich.
Mallinckrodt-Seitz Machinery Co., Inc., Buffalo, N. Y.
V. C. Patterson & Associates, Philadelphia, Pa.
Refrigeration Engineering Co., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

FREEZERS, ICE CREAM (See Ice Cream Freezers)

FREEZING SYSTEMS

Advanced Engineering Corp., Milwaukee, Wis.
Aircraft Production Engineers, Chicago, Ill.
Belt-Ice Corp., Seattle, Wash.
The Bush Mfg. Co., West Hartford, Conn.
Chip Ice Corp., Chicago, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Dean Products, Inc., Brooklyn, N. Y.
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
The King Company, Owosso, Mich.
Kramer Trenton Co., Trenton, N. J.
Mallinckrodt-Seitz Machinery Co. Inc., Buffalo, N. Y.
V. C. Patterson & Associates, Philadelphia, Pa.
Rexey Products Co., Canton, Ohio
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

FREEZING TANKS (See also Brine Tanks)

Aircraft Production Engineers, Chicago, Ill.
Chip Ice Corp., Chicago, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Dean Products, Inc., Brooklyn, N. Y.
Dole Refrigerating Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
King Zero Co., Chicago, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

"FREONS" (See Refrigerants)

FRICTION TAPE (See also Insulation Accessories and Adhesives)

FROZEN FOOD LOCKERS

Frick Co., Waynesboro, Pa.
Knickerbocker Stamping Co., Parkersburg, W. Va.
York Corp., York, Pa.

FUSIBLE PLUGS

Lunkenheimer Co., Cincinnati, Ohio
Superior Valve & Fittings Co., Pittsburgh, Pa.

GALVANIZING

Galvicon Corp., Chemical Div., New York, N. Y.
Ohio Galvanizing & Mfg. Co., Niles, Ohio.
Rotometals, San Francisco, Calif.

GAS COOLERS (See Heat Exchangers)

GAS MASKS (See Safety Appliances)

GASKETS AND GASKET MATERIALS, PACKING

Crane Packing Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Garlock Packing Co., Palmyra, N. Y.
E. F. Houghton & Co., Philadelphia, Pa.

GASKETS, DOOR (See Door Gaskets, Cold Storage)

GAUGE GLASSES, ACCESSORIES

Corning Glass Works, Corning, New York
York Corp., York, Pa.

GAUGES, AIR FILTER, DRAFT, DUCT PRESSURE

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
James P. Marsh Corp., Skokie, Ill.
Uehling Instrument Co., Paterson, N. J.

GAUGES, INDICATING: COMPOUND, PRESSURE, VACUUM, RECORDING

Ahrens Mfg. Co., Inc., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
The Electric Auto-Lite Co., Instrument & Gauge Div., Toledo, Ohio
Manheim Instrument Co., Inc., Hampton, Va.
Nuhbell Corp., Middleton, Ill.
James P. Marsh Corp., Skokie, Ill.
Manning, Maxwell and Moore, Inc., Stratford, Conn.
Mason-Neilan Regulator Co., Norwood, Mass.
Partlow Corp., New Hartford, N. Y.
Powers Regulator Co., Skokie, Ill.
Rochester Mfg. Co., Inc., Rochester, N. Y.
Taylor Instrument Companies, Rochester, N. Y.
Uehling Instrument Co., Paterson, N. J.
U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.

GAUGES, LIQUID LEVEL, TANK, ETC.

Ahrens Mfg. Co., Inc., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
Fisher Governor Co., Marshalltown, Iowa
Frick Co., Waynesboro, Pa.
General Controls Co., Glendale, Calif.
Henry Valve Co., Melrose Park, Ill.
Jorgensen Gage and Valve Co., Somerville, Mass.
Leeds and Northrup Co., Philadelphia, Pa.
Lunkenheimer Co., Cincinnati, Ohio
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Penn Instrument Division, Sharpe-Manning Co., Philadelphia, Pa.
Rochester Mfg. Co., Inc., Rochester, N. Y.
Uehling Instrument Co., Paterson, N. J.
Henry Vogt Machine Co., Louisville, Ky.
Weil Condenser Works, Brooklyn, N. Y.
York Corp., York, Pa.

GEARS

Augusta Iron & Steel Works, Inc., Augusta, Ga.
Jeffrey Mfg. Co., Columbus, Ohio
Link-Belt Co., Chicago, Ill.
Manning, Maxwell & Moore, Inc., Muskegon, Mich.

GENETRON (See Refrigerants)

GLASS INSULATING OR HEAT DEFLECTING

Corning Glass Works, Corning, N. Y.
Libbey Owens Ford Glass Company, Toledo, Ohio

GLYCOLS

Ansul Chemical Co., Marinette, Wis.
Bendix & Pope, Inc., Kansas City, Mo.
Carbide and Carbon Chemicals Co., Div. of Union Carbide and Carbon Corp., New York, N. Y.
Dow Chemical Co., Midland, Mich.
Nitrogen Division, Allied Chemical & Dye Corp., New York, N. Y.

GRANULATED CORK (See Insulation)

GREASE (See Lubricants)

GRILLES

Barber-Colman Co., Rockford, Ill.
Howe Ice Machine Co., Chicago, Ill.
Schultz & Koerting Co., Cornwells Heights, Pa.
Trane Co., LaCrosse, Wis.
Tuttle & Bailey, Inc., New Britain, Conn.

HAIR FELT INSULATION (See Insulation)

HAND TRUCKS (See Materials Handling Equipment)

HARDENING ROOMS (See Refrigerators, Sectional, etc.)

HEAT EXCHANGERS (See also Pressure Vessels)

Acme Industries, Inc., Jackson, Mich.
California Steel Products Div. of Acme Industries, Inc., Richmond, Calif.
Corning Glass Works, Corning, N. Y.
Creamery Package Mfg. Co., Chicago, Ill.
Dean Products, Inc., Brooklyn, N. Y.
Dole Refrigerating Co., Chicago, Ill.
Donnington Iron Works, Inc., Donnington, Pa.
Doyle & Roth Mfg. Co., Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Kramer Trenton Co., Trenton, N. J.
Majonnier Bros. Co., Chicago, Ill.
The National Pipe Bending Co., New Haven, Conn.
Niagara Blower Co., New York, N. Y.
Rexey Products Co., Canton, Ohio
Semco Co., Chicago, Ill.
Schultz & Koerting Co., Cornwells Heights, Pa.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Temprite Products Corp., Birmingham, Mich.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
Water Cooling Corp., New York, N. Y.
The Whitlock Mfg. Co., West Hartford, Conn.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.
Young Radiator Co., Racine, Wis.

HEAT PUMPS, SELF CONTAINED

Acme Industries, Inc., Jackson, Mich.
American Coils Co., Newark, N. J.
Carrier Corp., Syracuse, N. Y.
Frick Co., Waynesboro, Pa.
Trane Co., LaCrosse, Wis.
York Corp., York, Pa.

HEATER ELEMENTS (See also Defrosting Systems)

Bohstedt Gas Refrigerator Door Co., Chicago, Ill.
Corning Glass Works, Corning, New York
John H. Nunnett Inc., St. Albans, N. Y.
Trane Co., LaCrosse, Wis.
York Corp., York, Pa.

HEATING COILS (See also Coils by Type)

American Blower Corp., Detroit, Mich.
American Coils Co., Newark, N. J.
Chicago Nipple Mfg. Co., Chicago, Ill.
Dean Products, Inc., Brooklyn, N. Y.

Industrial Mfg. & Engineering Co., Chicago, Ill.
Kennard Corp., St. Louis, Mo.
Kramer Trenton Co., Trenton, N. J.
McQuay, Inc., Minneapolis, Minn.
Nesbitt Products Co., Canton, Ohio
Ranco Co., Chicago, Ill.
Reeding Mfg. Co., Pittsburgh, Pa.
Trane Co., LaCrosse, Wis.
Young Radiator Co., Racine, Wis.

HOISTS (See Cranes and Hoists)

HOSE

Aircare Mfg. Co., Inc., Pittsburgh, Pa.
A. G. Brown Mfg. Co., Inc., Manitowoc, N. Y.
Flexible Tubing Corp., Guilford, Conn.
Flexonics Corp., Maywood, Ill.
Rubberflex Corp., Bellerille, N. J.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Thermoid Co., Trenton, N. J.

HOSE CLAMPS (See Fittings, Hose)

HUMIDIFYING SYSTEMS (See also Dehumidifying Systems)

Advanced Engineering Corp., Milwaukee, Wis.
Armstrong Machine Works, Three Rivers, Mich.
Barber-Colman Co., Rockford, Ill.
Carrier Corp., Syracuse, N. Y.
General Controls Co., Glendale, Calif.
Hubbell Corp., Mundelein, Ill.
Johnson Service Co., Milwaukee, Wis.
Leeds and Northrup Co., Philadelphia, Pa.
John H. Murnott, Inc., St. Albans, N. Y.
Niagara Blower Co., New York, N. Y.
Parks Cramer Co., Fitchburg, Mass.
Partlow Corp., New Hartford, N. Y.
Powers Regulator Co., Skokie, Ill.
J. F. Pritchard & Co. of California, Kansas City, Mo.
Refrigerating Specialties Co., Chicago, Ill.
Research Products Corp., Madison, Wis.
Spraying Systems, Co., Bellwood, Ill.
Trane Co., LaCrosse, Wis.
Walton Laboratories, Inc., Irvington, N. J.
Water Cooling Corp., New York, N. Y.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

ICE BLOWERS AND CRUSHERS

Bateman Ice Processing Equipment, Mineral Wells, Texas.
Belt-Ice Corp., Seattle, Wash.
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Jeffrey Manufacturing Co. Inc., Philadelphia, Pa.
Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
E. L. Lewis & Co., Gastonia, N. C.
John H. Matthews & Son, N. Arlington, N. J.
Franklin P. Miller & Son, Inc. East Orange, N. J.
U. J. Ulinc Co., Washington, D. C.

ICE BUILDERS, LATENT HEAT (See Freezing Tanks)

ICE CAN DUMPS

Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
York Corp., York, Pa.

ICE CAN FILLERS

Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Kanawhaclair Stamping Co., Parkersburg, W. Va.
York Corp., York, Pa.

ICE CAN HOISTS (See Cranes & Hoists)

ICE CANS

Frick Co., Waynesboro, Pa.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Kanawhaclair Stamping Co., Parkersburg, W. Va.
The Ohio Galvanizing & Mfg. Co., Niles, Ohio
York Corp., York, Pa.

ICE CONVEYORS (See Conveyors and Components)

ICE CREAM FREEZERS

Creamery Package Mfg. Co., Chicago, Ill.
Fogel Refrigerator Co., Philadelphia, Pa.
Freezing Equipment Sales, Inc., York, Pa.
LaCrosse Cooler Co., LaCrosse, Wis.
John H. Matthews & Son, So. Arlington, N. J.
Franklin P. Miller & Son, Inc., East Orange, N. J.
Vilter Mfg. Co., Milwaukee, Wis.

ICE CREAM HARDENING ROOMS (See Refrigerators, Sectional, etc.)

ICE CUBE MACHINES (See also Ice Making Machines)

Aircraft Production Engineers, Chicago, Ill.
Carrier Corp., Syracuse, N. Y.
Flynn and Emrich Co., Baltimore, Md.
Gifford-Wood Co., Hudson, N. Y.
McQuay, Inc., Minneapolis, Minn.
Ron-Lake Inc., Hudson, Wis.
M. J. Ulinc Co., Washington, D. C.
York Corp., York, Pa.

ICE HANDLING ACCESSORIES

Gifford-Wood Co., Hudson, N. Y.
Hamer Machine Co., Minneapolis, Minn.
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
Lilly Co., Memphis, Tenn.
Link-Belt Co., Chicago, Ill.
E. L. Lewis & Co., Gastonia, N. C.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
York Corp., York, Pa.

ICE MAKING MACHINES

Aircraft Production Engineers, Chicago, Ill.
Belt-Ice Corp., Seattle, Wash.
Carrier Corp., Syracuse, N. Y.
Chip Ice Corp., Chicago, Ill.
Cut-Plate Corp., Chicago, Ill.
Fogel Refrigerator Co., Philadelphia, Pa.
Frick Co., Waynesboro, Pa.
Hoyt Ice Machine Co., Chicago, Ill.
J. & E. Hall, Ltd., Limited-Hall Canadian Refrigeration Div., Montreal, Que., Can.
Lipman Div., Vetco American Machine Co., Beloit, Wis.
McQuay, Inc., Minneapolis, Minn.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
York Corp., York, Pa.

ICE PLANTS

Aircraft Production Engineers, Chicago, Ill.
Chip Ice Corp., Chicago, Ill.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Limited-Hall Canadian Refrigeration Div., Montreal, Que., Can.
Hoyt Ice Machine Co., Chicago, Ill.
Lipman Div., Vetco American Machine Co., Beloit, Wis.
E. L. Lewis & Co., Gastonia, N. C.
Vilter Mfg. Co., Milwaukee, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

ICE SCORING MACHINES

Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Perfection Ice Scoring Machine Co., Fort Worth, Texas

ICE VENDING STATIONS (See Vending Stations, Ice)

INHIBITORS (See Water Treating Materials)

INJECTORS

Schutte & Koerting Co., Cornwells Heights, Pa.

INSTRUMENT PANELS

Aircare Mfg. Co., Inc., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Creamery Package Mfg. Co., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
Leeds and Northrup Co., Philadelphia, Pa.
James P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Penn Instrument Div., Burgess-Manning Co., Philadelphia, Pa.
Taylor Instrument Companies, Rochester, N. Y.
Uehling Instrument Co., Paterson, N. J.

INSTRUMENTS, INDICATING

Aircare Mfg. Co., Inc., Pittsburgh, Pa.
Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Electric Auto-Lite Co., Toledo, Ohio
General Controls Co., Glendale, Calif.
Hastings Instrument Co., Inc., Hampton, Va.
J-B-T Instruments Inc., New Haven, Conn.
Jorgensen Gage & Valve Co., Somerville, Mass.
Johnson Service Co., Milwaukee, Wis.
Leeds and Northrup Co., Philadelphia, Pa.
Manning, Maxwell & Moore Inc., Stratford, Conn.
Marion Electrical Instrument Co., Manchester, N. H.
James P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Moeller Instrument Co., Inc., Richmond Hill 18, N. Y.
Penn Instrument Div., Burgess-Manning Co., Philadelphia, Pa.
Powers Regulator Co., Skokie, Ill.
Rochester Mfg. Co., Inc., Rochester, N. Y.
Schutte & Koerting Co., Cornwells Heights, Pa.
Taylor Instrument Companies, Rochester, N. Y.
Uehling Instrument Co., Paterson, N. J.
Weston Electrical Instrument Corp., Newark, N. J.
York Corp., York, Pa.

INSTRUMENTS, RECORDING

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Electric Auto-Lite Co., Instrument & Gauge Div., Toledo, Ohio
General Control Co., Glendale, Calif.
Hastings Instrument Co., Inc., Hampton, Va.
Hubbell Corp., Mundelein, Ill.
Johnson Service Co., Milwaukee, Wis.
Leeds and Northrup Co., Philadelphia, Pa.
Manning, Maxwell & Moore Inc., Stratford, Conn.
Jas. P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Moeller Instrument Co., Inc., Richmond Hill, N. Y.
John H. Murnott, Inc., St. Albans, N. Y.
Penn Instrument Division, Burgess-Manning Co., Philadelphia, Pa.
Powers Regulator Co., Skokie, Ill.
Schutte & Koerting Co., Cornwells Heights, Pa.
Taylor Instrument Companies, Rochester, N. Y.
Uehling Instrument Co., Paterson, N. J.
Weston Electrical Instrument Corp., Newark, N. J.

INSULATION

American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Penn.
Baldwin-Hill Co., Trenton, N. J.
Carney Company, Inc., Mankato, Minn.
The Dow Chemical Co., Midland, Mich.
Nashalite Mfg. Corp., Grand Rapids, Mich.
Insulfax Corp., San Francisco, Calif.
Keasbey Co. Inc., Philadelphia, Pa.
Miracle Adhesives Corp., New York, N. Y.
MMM, Inc., Houston, Texas
J. W. Mortell Co., Kankakee, Ill.
Mundet Cork Corp., North Bergen, N. J.
National Cork Co., Englewood, N. J.
E. H. O'Neill Fibern Co., Clarey, Ill.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Pittsburgh Corning Corp., Pittsburgh, Pa.
Presstite Engineering Co., St. Louis, Mo.
Virginia Smelting Co., West Norfolk, Va.
Zonolite Co., Chicago, Ill.

INSULATION ACCESSORIES

American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton N. J.
Dow Chemical Co., Midland, Mich.
Nashalite Mfg. Corp., Grand Rapids, Mich.
Miracle Adhesives Corp., New York, N. Y.
Goodloe E. Moore, Inc., Danville, Ill.
J. W. Mortell Co., Kankakee, Ill.
Mundet Cork Corp., North Bergen, N. J.
National Cork Co., Englewood, N. J.
E. H. O'Neill Fibern Co., Clarey, Ill.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Pittsburgh Corning Corp., Pittsburgh, Pa.
Presstite Engineering Co., St. Louis, Mo.
Virginia Smelting Co., West Norfolk, Va.
Zonolite Co., Chicago, Ill.

INSULATION ADHESIVES (See Adhesives, Cements, etc.

INSULATION FINISHES (See Adhesives, Cements, Compounds, Coatings)

INSULATION, REFLECTIVE

Carney Company Inc., Mankato, Minn.
Insulfax Corp., San Francisco, Calif.
Miracle Adhesives Corp., New York, N. Y.
Silvercote Products Inc., Chicago, Ill.

INSULATION, THERMAL HIGH TEMPERATURE

Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J.
Carney Company Inc., Mankato, Minn.
Miracle Adhesives Corp., New York, N. Y.
Mundet Cork Corp., North Bergen, N. J.
Myrtle Adhesive Products, Chicago, Ill.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Pittsburgh Corning Corp., Pittsburgh, Pa.
Quigley Co. Inc., New York, N. Y.
Zonolite Co., Chicago, Ill.

INSULATION, THERMAL LOW TEMPERATURE

American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J.
Carney Company Inc., Mankato, Minn.
Nashalite Mfg. Corp., Grand Rapids, Mich.
Miracle Adhesives Corp., New York, N. Y.
MMM, Inc., Houston, Texas
Mundet Cork Corp., North Bergen, N. J.
Myrtle Adhesive Products, Chicago, Ill.
National Cork Co., Englewood, N. J.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Pacific Lumber Co., San Francisco, Calif.
Pittsburgh Corning Corp., Pittsburgh, Pa.
Quigley Co., Inc., New York, N. Y.
Tidelder, Inc., Prospect, N. Y.
Zonolite Co., Chicago, Ill.

INSULATION, THERMAL: LOW TEMPERATURE, FORMS, FITTINGS, PIPE COVERINGS

American Hair & Felt Co., Chicago, Ill.
Armstrong Cork Co., Lancaster, Pa.
Baldwin-Hill Co., Trenton, N. J.
Insulfax Corp., San Francisco, Calif.
MMM, Inc., Houston, Texas
Miracle Adhesives Corp., New York, N. Y.
J. W. Mortell Co., Kankakee, Ill.
Mundet Cork Corp., North Bergen, N. J.
Myrtle Adhesive Products, Chicago, Ill.
National Cork Co., Englewood, N. J.
Owens-Corning Fiberglas Corp., Toledo, Ohio
Pittsburgh Corning Corp., Pittsburgh, Pa.
Tidelder, Inc., Prospect, N. Y.

INSURANCE

Bruce Dodson & Co., Kansas City, Mo.

LARD CHILLERS (See Food Processing Machinery)

LATENT HEAT TANKS (See Pressure Vessels)

LEAK DETECTORS AND INDICATORS

Airsorb Mfg. Co., Inc., Pittsburgh, Pa.
Linde Air Products Co., Div. of Union Carbide & Carbon Corp., New York, N. Y.
Velocity Power Tool Co. Pittsburgh, Pa.

LEATHER BELTING (See Belts and Belting)

LIFT TRUCKS (See Materials Handling)

LIQUID COOLERS

Acme Industries, Inc., Jackson, Mich.
American Coils Co., Newark, N. J.
California Steel Products Div. of Adams Industries, Inc., Richmond, Calif.
Creamery Package Mfg. Co., Chicago, Ill.
Dean Products, Inc., Brooklyn, N. Y.
Dole Refrigeration Co., Chicago, Ill.
Downingtown Iron Works, Inc., Div. of Pressed Steel Tank Co., Downingtown, Pa.
Doyle & Roth Mfg. Co., Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co. Chicago, Ill.
Modernaire Bros. Co., Chicago, Ill.
Recey Products Co., Canton, Ohio
Schutte & Koerting Co., Cornwells Heights, Pa.
Temprite Products Corp., Birmingham, Mich.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
Whitlock Mfg. Co., West Hartford, Conn.
York Corp., York, Pa.
Young Radiator Co., Racine, Wis.

LIQUID INDICATORS

Allis Mfg. Co., Chicago, Ill.
Barber-Colman Co., Rockford, Ill.
Frick Co., Waynesboro, Pa.
Henry Valve Co., Melrose Park, Ill.
Ice Plant Equipment Co., Philadelphia, Pa.
Jorgensen Gage & Valve Co., Somerville, Mass.
Modernaire Bros. Co., Chicago, Ill.
Penn Instrument Div., Sargent-Manning Co., Philadelphia, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
Superior Valve & Fittings Co., Pittsburgh, Pa.
York Corp., York, Pa.

LIQUID LEVEL INDICATORS (See Gauges, Liquid Level)

LIQUID RECIRCULATING SYSTEMS

Aircraft Production Engineers, Chicago, Ill.
Bailey Meter Co., Cleveland, Ohio
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
Howe Ice Machine Co., Chicago, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

LIQUID RETURN SYSTEMS

Freezing & Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
Ray Engineering & Sales Co., Oklahoma City, Okla.
Uehling Instrument Co., Paterson, N. J.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

LITHIUM SALTS

Dean Products, Inc., Brooklyn, N. Y.

LOW TEMPERATURE TEST CABINETS

Dean Products, Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Harris Refrigeration Co., Cambridge, Mass.
Modernaire Bros. Co., Chicago, Ill.
York Corp., York, Pa.

LUBRICANTS, GRAPHITE, GREASE, OIL

Anzol Chemical Co., Marinette, Wis.
Carbide and Carbon Chemicals Co., Div. of Union Carbide and Carbon Corp., New York, N. Y.
E. F. Houghton & Co., Philadelphia, Pa.
The Texas Co., New York, N. Y.
Virginia Smelting Co., West Norfolk, Va.
York Corp., York, Pa.

LUBRICATING OIL COOLERS (See also Heat Exchangers)

Downingtown Iron Works, Inc., Div. of Pressed Steel Tank Co., Downingtown, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
Whitlock Mfg. Co., West Hartford, Conn.
York Corp., York, Pa.
Young Radiator Co., Racine, Wis.

LUBRICATORS

Elliott Co., Newark, N. J.
Frick Co., Waynesboro, Pa.
Lunkenheimer Co., Cincinnati, Ohio
Schutte & Koerting Co., Cornwells Heights, Pa.
York Corp., York, Pa.

LUMBER SPECIALTIES

Mahogany Importing Co., Los Angeles, Calif.
National Pallet Corp., Pittsburgh, Pa.
Sterling Lumber & Supply Co., Chicago, Ill.

MAGNESIUM CHLORIDE (See Water Treating Materials)

MAGNETIC VALVES (See Solenoid Valves)

MASKS, AMMONIA (See Safety Appliances)

MATERIALS HANDLING EQUIPMENT (See also Fork Lift Trucks)

Acme Pallet Co., Inc., New York, N. Y.
Allis-Chalmers, Buda Division, Harvey, Ill.
Automatic Transportation Co., Chicago, Ill.
Barrett-Cravens Co., Northbrook, Ill.
Calcon Corp., Elyria, Ohio
Gifford-Wood Co., Hudson, N. Y.
Harnischfeger Corp., Milwaukee, Wis.
Hyster Co., Portland, Oreg.
Jeffrey Mfg. Co., Columbus, Ohio
Kelchner-Decker Stamping Co., Parkersburg, W. Va.
Lewis-Shepard Products, Inc., Watertown, Mass.
John H. Matthews & Sons, No. Arlington, N. J.
Mercury Mfg. Co., Chicago, Ill.
Moto-Truc Co., Cleveland, Ohio
John H. Marcott, Inc., St. Albans, N. Y.
National Pallet Corp., Pittsburgh, Pa.
Ohio Galvanizing & Mfg. Co., Niles, Ohio
Palltex, Inc., New York City, N. Y.
Pallets, Inc., Hudson Falls, N. Y.
Rapids-Standard Co., Inc., Grand Rapids, Mich.
Republic Steel Corp., Cleveland, Ohio
Revolvator Co., North Bergen, N. J.
Silent Hoist and Crane Co., Brooklyn, N. Y.
Sterling Lumber & Supply Co., Chicago, Ill.
Wilder Mfg. Co., Inc., Port Jervis, N. Y.

METALLIC PACKING (See Packings, Mechanical, Metallic)

METERS, BRINE

Rockwell Mfg. Co., Pittsburgh, Pa.

METERS, ELECTRIC (See also Electrical Line Equipment)

Airsorb Mfg. Co., Inc., Pittsburgh, Pa.
J-B-T Instruments, Inc., New Haven, Conn.
Marion Electrical Instrument Co., Manchester, N. H.
Weston Electrical Instrument Corp., Newark, N. J.

METERS, FLOW: AIR, GAS, FLUIDS

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
Mason-Neilan Regulator Co., Norwood, Mass.
Rockwell Mfg. Co., Pittsburgh, Pa.
Roots Connersville Blower Div., Dresser Industries, Inc., Connersville, Ind.
Uehling Instrument Co., Paterson, N. J.

METHYL CHLORIDE (See Refrigerants)

MILK COOLERS (See Chillers and Coolers)

MOTOR BASES, BRACKETS AND SUPPORTS

Louis Allis Co., Milwaukee, Wis.
Ideal Electric & Mfg. Co., Mansfield, Ohio

MOTOR CONTROLS AND STARTERS

Airsorb Mfg. Co., Inc., Pittsburgh, Pa.
Automatic Switch Co., Orange, N. J.
Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland, Ohio
Electric Controller & Mfg. Co., Cleveland, Ohio
Electric Machinery Mfg. Co., Minneapolis, Minn.
General Controls Co., Glendale, Calif.
Harnischfeger Corp., Milwaukee, Wis.
Ideal Electric & Mfg. Co., Mansfield, Ohio
Reynolds Electric Co., River Grove, Ill.
Weston Electrical Instrument Corp., Newark, N. J.
York Corp., York, Pa.

MOTOR, ELECTRIC PROTECTION DEVICES

Automatic Switch Co., Orange, N. J.
Clark Controller Co., Cleveland, Ohio

MOTOR GENERATOR SETS

Louis Allis Co., Milwaukee, Wis.
Electric Machinery Mfg. Co., Minneapolis, Minn.
Elliott Co., Jeannette, Pa.
Fairbanks, Morse & Co., Chicago, Ill.
Harnischfeger Corp., Milwaukee, Wis.
Ideal Electric & Mfg. Co., Mansfield, Ohio
Reliance Electric & Engineering Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Star-Kimble Motor Division, Kimble Printing Press & Mfg. Co., Bloomfield, N. J.

MOTORS, ELECTRIC

Louis Allis Co., Milwaukee, Wis.
Cleveland Electric Motor Co., Cleveland, Ohio
Electric Machinery Mfg. Co., Minneapolis, Minn.
Fairbanks, Morse & Co., Chicago, Ill.
Harnischfeger Corp., Milwaukee, Wis.
Ideal Electric & Mfg. Co., Mansfield, Ohio
Reliance Electric & Engineering Co., Cleveland, Ohio
Robbins & Myers, Inc., Springfield, Ohio
Star-Kimble Motor Division, Kimble Printing Press & Mfg. Co., Bloomfield, N. J.
Wagner Electric Corp., St. Louis, Mo.

NEEDLE VALVE ASSEMBLIES

Fisher Governor Co., Marshalltown, Iowa
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Superior Valve & Fittings Co., Pittsburgh, Pa.
York Corp., York, Pa.

NITROGEN

Linde Air Products Co., Div. of Union Carbide and Carbon Corp., New York, N. Y.

NOZZLES, SPRAY

Bete Fog Nozzle, Inc., Greenfield, Mass.
Binks Mfg. Co., Chicago, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Link-Belt Co., Chicago, Ill.
Monarch Mfg. Works, Inc., Philadelphia, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
Spraying Systems Co., Bellwood, Ill.
Water Cooling Corp., New York, N. Y.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

OIL SEPARATORS (See also Pressure Vessels)

Acme Industries, Inc., Jackson, Mich.
Aircraft Production Engineers, Chicago, Ill.
Frick Co., Waynesboro, Pa.
J. & E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div., Montreal, Que., Canada
Temprite Products Corp., Birmingham, Mich.
Vilter Mfg. Co., Milwaukee, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

OIL COOLERS AND SYSTEMS (See Heat Exchangers)

OIL BURNING ENGINES (See Engines, Diesel)

OIL FILTERS (See Filters, Oil)

OIL PUMPS (See Pumps by Types)

OIL TANKS (See Pressure Vessels)

OIL TESTING INSTRUMENTS

Serin Corp., Neptune City, N. J.

OILING SYSTEMS (See Lubricators)

OZONE AIR PURIFIERS (See Air Purification Equipment)

PACKING HOUSE MACHINERY

K. G. Brown Mfg. Co., Inc., Middletown, N. Y.
York Corp., York, Pa.

PACKINGS, MECHANICAL, METALLIC

Alpha Metals, Inc., Jersey City, N. J.
Crane Packing Co., Chicago, Ill.
Durametallic Corp., Kalamazoo, Mich.
Frick Co., Waynesboro, Pa.
Garlock Packing Co., Palmyra, N. Y.
Hobbs Hydraulic Packing Co., Chicago, Ill.
Rodent, Inc., San Francisco, Calif.
York Corp., York, Pa.

PAINTS (See Finishes)

PALLETS (See Materials Handling)

PANS, DRIP

Dole Refrigerating Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.
York Corp., York, Pa.

PAPER, BUILDING (See Insulation Accessories)

PEST CONTROL SUPPLIES

Borden & Page, Inc., Kansas City, Mo.
Dow Chemical Co., Midland, Mich.

PETROLEUM PRODUCTS (See Lubricants)

PILOT LIGHTS (See Protective Devices)

PIPE AND TUBING

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Alpha Metals, Inc., Jersey City, N. J.
Babcock & Wilcox Co., Beaver Falls, Pa.
Bailey Meter Co., Cleveland, Ohio
A. M. Byers Co., Pittsburgh, Pa.
Penn-Texas Tube Co., Butler, Pa.
National Tube Division, United States Steel Corp., Pittsburgh, Pa.
Republic Steel Corp., Cleveland, Ohio
Republic Steel Corp., Steel and Tubes Div., Cleveland
Trent Tube Co., East Troy, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
Wheeling Steel Corp., Wheeling, W. Va.

PIPE COILS AND BENDS (See Coils, Bends and Baffle Assemblies)

PIPE COVERINGS (See Insulation)

PIPE FITTINGS (See Fittings, Refrigerant)

PIPE HANGERS

Frick Co., Waynesboro, Pa.
York Corp., York, Pa.

PIPING, PLASTIC

Alpha Plastics, Inc., West Orange, N. J.
Dow Chemical Co., Midland, Mich.
National Tube Division, United States Steel Corp., Pittsburgh, Pa.
Republic Steel Corp., Cleveland, Ohio

PIPING, REFRIGERANTS

Aircraft Production Engineers, Chicago, Ill.
Frick Co., Waynesboro, Pa.
National Tube Division, United States Steel Corp., Pittsburgh, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

PISTON RINGS

Garlock Packing Co., Palmyra, N. Y.
Safety Seal Piston Ring Co., Ft. Worth, Texas
York Corp., York, Pa.

PLATE COILS (See Coils, Plate)

PLATFORM SCALES (See Scales, Platform)

POWER TRANSMISSION (See Electrical Line Equipment)

PREFABRICATED DUCTWORK (See Duct Accessories and Fittings)

PRESSURE REGULATORS (See Regulators, Pressure)

PRESSURE RELIEF DEVICES (See Pressure Relief Valves)

PRESSURE RELIEF VALVES

Aircraft Production Engineers, Chicago, Ill.
AP Controls Corp., Milwaukee, Wis.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Co., Decatur, Ill.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Fisher Governor Co., Marshalltown, Iowa
Frick Co., Waynesboro, Pa.
Henry Valve Co., Melrose Park, Ill.
Hoblitt Corp., Mandeville, Ill.
Lunkenheimer Co., Cincinnati, Ohio
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Refrigerating Specialties Co., Chicago, Ill.
Ray Engineering & Sales Co., Oklahoma City, Okla.
Schutte & Koerting Co., Cornwells Heights, Pa.
Cyrus Shaw Co., Chicago, Ill.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Trane Co., LaCrosse, Wis.
York Corp., York, Pa.

PRESSURE VESSELS

Acme Industries, Inc., Jackson, Mich.
Aircraft Production Engineers, Chicago, Ill.
Amsco Chemical Co., Marinette, Wis.
Augusta Iron & Steel Works, Inc., Augusta, Ga.
Belt-Ice Corp., Seattle, Wash.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
California Steel Products Div. of Adams Industries, Inc., Richmond, Calif.
Dean Products Inc., Brooklyn, Calif.
Dersch, Sammons & Rogers, Inc., Chicago, Ill.
Detroit Ice Machine Co., Detroit, Mich.
Dole Refrigerating Co., Chicago, Ill.
Donnybrook Iron Works, Inc., Donnybrook, Pa.
Doyle & Roth Mfg. Co. Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
J. E. Hall, Ltd., Lindo-Hall Canadian Refrigeration Div., Montreal, Que. Can.
Hoven Ice Machine Co., Chicago, Ill.
King Zaire Co., Chicago, Ill.
Kramer Trenton Co., Trenton, N. J.
Lofoi Div., Westinghouse Air Brake Co., Milwaukee, Wis.
Majestic Bros. Co., Chicago, Ill.
National Pipe Bending Co., New Haven, Conn.
National Tube Division, U. S. Steel Corp., Pittsburgh.
Niagara Blower Co., New York, N. Y.
Ray Engineering & Sales Co., Oklahoma City, Okla.
Schutte & Koerting Co., Cornwells Heights, Pa.
Temprite Products Corp., Birmingham, Mich.
The Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
J. E. Watkins Co., Maywood, Ill.
Whitlock Mfg. Co., West Hartford, Conn.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PRESSURESTATS (See Switches and Controls; also Controls, Pressure Actuated)

PROTECTIVE COATINGS

Amercoat Corp., Southgate, Calif.
American Chemical Paint Co., Ambler, Pa.
Armite Laboratories, Los Angeles, Calif.
Augusta Iron & Steel Works, Inc., Augusta, Ga.
Dearborn Chemical Co., Chicago, Ill.
Dow Chemical Co., Midland, Mich.
Foodcoters, Inc., New York City.
Galvicon Corp., Chemical Div., New York, N. Y.
Grand Rapids Varnish Corp., Grand Rapids, Mich.
Alfred Hague & Co., Brooklyn, N. Y.
E. F. Houghton & Co., Philadelphia, Pa.
Koppers Co., Inc., Pittsburgh, Pa.
Miracle Adhesives Corp., New York, N. Y.
J. W. Mortell Co., Kankakee, Ill.
National Cork Co., Englewood, N. J.
Oakite Products, Inc., New York, N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Quigley Co., Inc., New York, N. Y.
Rotometals, San Francisco, Calif.
Stanicote Mfg. Co., St. Louis, Mo.
Virginia Smelting Co., West Norfolk, Va.
Water Treatment Engineers, Cleveland, Ohio
Wilbur & Williams Co., Boston, Mass.

PROTECTIVE DEVICES

Bailey Meter Co., Cleveland, Ohio
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Valve Mfg. Co., Decatur, Ill.
Clark Controller Co., Cleveland, Ohio
Frick Co., Waynesboro, Pa.
Charles S. Lewis Co., Inc., St. Louis, Mo.

PULLEYS (See Drives and Couplings)

PUMP VALVES

Automatic Switch Co., Orange, N. J.
Bailey Meter Co., Cleveland, Ohio
York Corp., York, Pa.

PUMPS (See Types or use listed below)

PUMPS, ACCESSORIES AND PARTS

American Marsh Pumps, Inc., Battle Creek, Mich.
Deming Co., Salem, Ohio
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
Lancaster Pump & Mfg. Co. Inc., Lancaster, Pa.
Lawrence Pump & Engine Co., Lawrence, Mass.
Chas. S. Lewis Co. Inc., St. Louis 2, Mo.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Pump & Machinery Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, AIR

Samuel S. Gelber Co., Chicago, Ill.
Nash Engineering Co., South Norwalk, Conn.
Schutte & Koerting Co., Cornwells Heights, Pa.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, AMMONIA

Aircraft Production Engineers, Chicago, Ill.
Freezing Equipment Sales, Inc., York, Pa.
Frick Co., Waynesboro, Pa.
Samuel S. Gelber Co., Chicago, Ill.
Lawrence Pump & Engine Co., Lawrence, Mass.
Chas. S. Lewis Co. Inc., St. Louis, Mo.
Ray Engineering & Sales Co., Oklahoma City, Okla.
Robbins & Myers, Inc., Springfield, Ohio
Henry Vogt Machine Co., Louisville, Ky.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, BRINE

American Marsh Pumps, Inc., Battle Creek, Mich.
Creamery Package Mfg. Co., Chicago, Ill.
Deming Co., Salem, Ohio
Samuel S. Gelber Co., Chicago, Ill.
Gould Pumps, Inc., Seneca Falls, N. Y.
Lancaster Pump & Mfg. Co. Inc., Lancaster, Pa.
Lawrence Pump & Engine Co., Lawrence, Mass.
Chas. S. Lewis Co. Inc., St. Louis, Mo.
Robbins & Myers, Inc., Springfield, Ohio
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, CENTRIFUGAL

Carver Pump Co., Muscatine, Iowa.
Creamery Package Mfg. Co., Chicago, Ill.
Deming Co., Salem, Ohio
Fairbanks, Morse & Co., Chicago, Ill.
Samuel S. Gelber Co., Chicago, Ill.
Gould Pumps, Inc., Seneca Falls, N. Y.
Lancaster Pump & Mfg. Co. Inc., Lancaster, Pa.
Lawrence Pump & Engine Co., Lawrence, Mass.
Chas. S. Lewis Co. Inc., St. Louis, Mo.
Robbins Machinery Co., Cincinnati, Ohio
Trane Co., LaCrosse, Wis.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, DEEP WELL

Deming Co., Salem, Ohio
Fairbanks, Morse & Co., Chicago, Ill.
Gould Pumps, Inc., Seneca Falls, N. Y.
Lancaster Pump & Mfg. Co. Inc., Lancaster, Pa.
Layne & Bowler, Inc., Memphis, Tenn.
Schutte & Koerting Co., Cornwells Heights, Pa.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, FREON AND METHYL

American Marsh Pumps, Inc., Battle Creek, Mich.
Gould Pumps, Inc., Seneca Falls, N. Y.
Chas. S. Lewis Co. Inc., St. Louis, Mo.
Lipman Div., Yates American Machine Co., Beloit, Wis.
Robbins & Myers Inc., Springfield, Ohio
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, GEAR, VANE, ETC.

Deming Co., Salem, Ohio
Samuel S. Gelber Co., Chicago, Ill.
Gould Pumps, Inc., Seneca Falls, N. Y.
Schutte & Koerting Co., Cornwells Heights, Pa.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, RECIPROCATING

American Marsh Pumps, Inc., Battle Creek, Mich.
Deming Co., Salem, Ohio
Fairbanks, Morse & Co., Chicago, Ill.
Gould Pumps, Inc., Seneca Falls, N. Y.
Lancaster Pump & Mfg. Co. Inc., Lancaster, Pa.
Lipman Div., Yates American Machine Co., Beloit, Wis.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, ROTARY

Deming Co., Salem, Ohio
Fairbanks, Morse & Co., Chicago, Ill.
Samuel S. Gelber Co., Chicago, Ill.
Gould Pumps, Inc., Seneca Falls, N. Y.
Nash Engineering Co., South Norwalk, Conn.
Roots Connersville Blower Div., Dresser Industries, Inc., Connersville, Ind.
Schutte & Koerting Co., Cornwells Heights, Pa.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PUMPS, VACUUM

Alrcoa Mfg. Co. Inc., Pittsburgh, Pa.
American Marsh Pumps, Inc., Battle Creek, Mich.
Samuel S. Gelber Co., Chicago, Ill.
Majestic Bros. Co., Chicago, Ill.
Nash Engineering Co., South Norwalk, Conn.
Robbins & Myers, Inc., Springfield, Ohio
Roots Connersville Blower Div., Dresser Industries, Inc., Connersville, Ind.
Schutte & Koerting Co., Cornwells Heights, Pa.
Warren Steam Pump Co. Inc., Warren, Mass.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

PURGERS, REFRIGERANT

Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
Gould Pumps, Inc., Seneca Falls, N. Y.
Ray Engineering & Sales Co., Oklahoma City, Okla.
J. E. Watkins Co., Maywood, Ill.
York Corp., York, Pa.

PURIFIERS, AMMONIA (See Stills, Ammonia)

PURIFIERS, OIL (See also Filters, Oil)

Hendricks-Hershey of Indiana, Inc., Lebanon, Ind.
York Corp., York, Pa.

PURIFIERS, WATER (See Water Treatment)

RECEIVERS (See Pressure Vessels)

RECIRCULATORS, REFRIGERANT

Frick Co., Waynesboro, Pa.
V. C. Patterson & Associates, Philadelphia, Pa.
M. A. Phillips & Co., Chicago, Ill.
Rex Engineering & Sales Co., Oklahoma City, Okla.
Vilter Mfg. Co., Milwaukee, Wis.
J. E. Watkins Co., Chicago, Ill.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

RECORDERS, HUMIDITY, PRESSURE TEMPERATURE (See Instruments, Recording)

REDUCERS, SPEED (See Drives & Couplings)

REDUCING GEARS (See Drives & Couplings)

REFRIGERANTS

Ansul Chemical Co., Marinette, Wis.
Barada & Page, Inc., Kansas City, Mo.
Henry Bower Chemical Mfg. Co., Philadelphia, Pa.
Dow Chemical Co., Midland, Mich.
Electrochemicals Dev., E. I. du Pont de Nemours & Co., Wilmington, Del.
General Chemical Div., Allied Chemical & Dye Corp., New York, N. Y.
Kinetic Chemicals Div., E. I. du Pont de Nemours & Co., Wilmington, Del.
Nitrogen Div., Allied Chemical & Dye Corp., New York, N. Y.
Virginia Smelting Co., West Norfolk, Va.

REFRIGERATORS: SECTIONAL, PORTABLE, PREFABRICATED

Bell Ice Corp., Seattle, Wash.
Chase Cold Storage Door Co., Reading, Pa.
Creamery Package Mfg. Co., Chicago, Ill.
Fogel Refrigerator Co., Philadelphia, Pa.
Gennett & Sons, Inc., Richmond, Ind.
LaCrosse Cooler Co., LaCrosse, Wis.
Refrigeration Engineering Co., Minneapolis, Minn.
U. S. Thermo Controls Co., Minneapolis, Minn.
Vilter Manufacturing Co., Milwaukee, Wis.
York Corp., York, Pa.

REGISTERS (See Grilles)

REGULATING VALVES (See Valves Regulating; also see Regulators, Flow)

REGULATORS, DAMPER (See Damper Motors and Regulators)

REGULATORS, FLOW

Aircraft Production Engineers, Chicago, Ill.
AP Controls Co., Milwaukee, Wis.
Automatic Switch Co., Orange, N. J.
Bailey Meter Co., Cleveland, Ohio
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Valve Mfg. Co., Decatur, Ill.
Frick Co., Waynesboro, Pa.
General Controls Co., Glendale, Calif.
Hubbell Corp., Mondelein, Ill.
Johnson Service Co., Milwaukee, Wis.
James P. Marsh Corp., Skokie, Ill.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Mason-Neilan Regulator Co., Norwood, Mass.
Partlow Corp., New Hartford, N. Y.
Penn Instrument Div., Burgess-Manning Co., Philadelphia, Pa.
Refrigerating Specialties Co., Chicago, Ill.
Schutte & Koerting Co., Cornwells Heights, Pa.
York Corp., York, Pa.

REGULATORS, LIQUID, LEVEL (See Controls, Liquid Level)

REGULATORS, PRESSURE

Aircraft Production Engineers, Chicago, Ill.
AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Co. Decatur, Ill.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Dersch, Geenstein & Mauer, Inc., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
Hubbell Corp., Mondelein, Ill.
Johnson Service Co., Milwaukee, Wis.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Mason-Neilan Regulator Co., Norwood, Mass.
Marsh Corp., Chicago, Ill.
Powers Regulator Co., Skokie, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Reliance Mfg. Co., Pittsburgh, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Temprite Products Corp., Birmingham, Mich.
York Corp., York, Pa.

REGULATORS, TEMPERATURE

AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
A. W. Cash Co., Decatur, Ill.
Control Engineering & Supply Co., Dallas, Texas
Hubbell Corp., Mondelein, Ill.
Johnson Service Co., Milwaukee, Wis.
Leeds & Northrup Co., Philadelphia, Pa.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
James P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Marsh Corp., Chicago, Ill.
Partlow Corp., New Hartford, N. Y.
Powers Regulator Co., Skokie, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
York Corp., York, Pa.

REGULATORS, VOLTAGE (See Electrical Line Equipment)

RELAYS, ELECTRICAL (See Motor Controls and Starters)

RELIEF VALVES (See Pressure Relief Valves)

RESISTORS, ELECTRICAL (See Motor Controls and Starters)

RETARDERS, CORROSION (See Water Treatment)

RHEOSTATS (See Motor Controls and Starters)

ROOF COOLING

Ruppright's Rotary Roof Cooler, Los Angeles, Calif.
Water Cooling Corp., New York, N. Y.

RUBBER PRODUCTS

Condor Engineering Co., Montclair, N. J.
Garlock Packing Co., Palmyra, N. Y.
E. F. Houghton & Co., Philadelphia, Pa.
Thermoid Co., Trenton, N. J.

RUST PREVENTATIVES (See Coatings, also Waterproof Paints)

SAFETY APPLIANCES

Asco Protection Equipment Co., South Haven, Mich.
Ice Plant Equipment Co., Philadelphia, Pa.
York Corp., York, Pa.

SAFETY DEVICES (See Protective Devices)

SAFETY VALVES (See Valves, Safety, also Pressure Relief Valves)

SCALE TRAPS (See also Strainers, Refrigerant)

SCALE TREATMENT (See Water Treatment)

SCALES, PLATFORM

Fairbanks, Morse & Co., Chicago, Ill.
John H. Marcott, Inc., St. Albans, N. Y.

SEALING COMPOUNDS

Armite Laboratories, Los Angeles, Calif.
Crane Packing Co., Chicago, Ill.
J. W. Mortell Co., Kankakee, Ill.
Presstite Engineering Co., St. Louis, Mo.
Tuforete Co. Inc., Des Moines, Iowa

SEALS SHAFT, MECHANICAL

Crane Packing Co., Chicago, Ill.
Durametallic Corp., Kalamazoo, Mich.
Frick Co., Waynesboro, Pa.
Garlock Packing Co., Palmyra, N. Y.
York Corp., York, Pa.

SEATS, COMPRESSOR VALVE (See Compressor Parts and Accessories)

SEPARATORS, OIL

Asco Industries, Inc., Jackson, Mich.
Aircraft Production Engineers, Chicago, Ill.
Frick Co., Waynesboro, Pa.
Hendelle-Hershey of Indiana, Inc., Lebanon, Ind.
Temprite Products Corp., Birmingham, Mich.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

SHAFT COUPLINGS (See Drives & Couplings)

SHAFT SEALS (See Seals, Shaft, Mechanical)

SHELLS (See Pressure Vessels)

SIGHT GLASSES (See Liquid Indicators; also Gauge Glasses)

SIGNALS, ELECTRIC (See also Protective Devices)

Alarco Mfg. Co., Inc., Pittsburgh, Pa.

SILICA GEL (See Dehydrants)

SIZED ICE EQUIPMENT

Ballard Sales Co., Ft. Worth, Texas
Bateman Ice Processing Equipment, Mineral Wells, Texas.
Gifford-Wood Co., Hudson, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Lilly Co., Memphis, Tenn.
John H. Matthews & Sons, No. Arlington, N. J.
York Corp., York, Pa.

SODIUM CHLORIDE

Solvay Process Division, Allied Chemical & Dye Corp., New York, N. Y.

SODIUM DICHROMATE (See Water Treating Materials)

SOFTENERS, WATER (See Water Treatment)

SOLDERS

Alpha Metals, Inc., Jersey City, N. J.
Handy & Harman, New York, N. Y.
Ratemetals, San Francisco, Calif.

SOLENOID VALVES, REFRIGERANT

Alco Valve Co., St. Louis, Mo.
AP Controls Corp., Milwaukee, Wis.
Automatic Switch Co., Orange, N. J.
Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland, Ohio
Frick Co., Waynesboro, Pa.
General Controls Co., Glendale, Calif.
Hubbell Corp., Mondelein, Ill.
James P. Marsh Corp., Skokie, Ill.
Marsh Corp., Chicago, Ill.
Powers Regulator Co., Skokie, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schutte & Koerting Co., Cornwells Heights, Pa.
Sporlan Valve Co., St. Louis, Mo.
York Corp., York, Pa

SOLENOID VALVES, WATER, BRINE, ETC.

Alco Valve Co., St. Louis, Mo.
AP Controls Corp., Milwaukee, Wis.
Automatic Switch Co., Orange, N. J.
Clark Controller Co., Cleveland, Ohio
General Controls Co., Glendale, Calif.
James P. Marsh Corp., Skokie, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Sporlan Valve Co., St. Louis, Mo.

SPEED CHANGERS (See Drives)

SPEED INDICATORS (See Revolution Counters or Tachometers)

SPEED REDUCING GEARS (See Drives)

SPRAY HUMIDIFIERS (See Humidifying Systems)

SPRAY PONDS (See Cooling Towers)

Binks Mfg. Co., Chicago, Ill.
J. P. Carlisle Co., Greensboro, N. Car.
Carrier Corp., Syracuse, N. Y.
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
York Corp., York, Pa.

SPRAY SYSTEMS AND ACCESSORIES

Binks Mfg. Co., Chicago, Ill.
Schutte & Koerting Co., Cornwells Heights, Pa.
Spraying Systems Co., Bellwood, Ill.

SPRAY TYPE EVAPORATORS (See Coils, Blower Units)

STARTERS, ELECTRIC MOTOR (See Motor Controls and Starters)

STEAM JET VACUUM COOLING SYSTEMS (See Ejectors)

STEEL PIPE (See Pipe and Tubing)

STILLS, AMMONIA

Aircraft Production Engineers, Chicago, Ill.
Frick Co., Waynesboro, Pa.
Goulds Pumps, Inc., Seneca Falls, N. Y.
Ilex Engineering & Sales Co., Oklahoma City 7, Okla.

STORAGE BATTERIES (See Batteries Storage)

STRAINERS, AIR, OIL, STEAM, WATER

Alco Valve Co., St. Louis, Mo.
AP Controls Corp., Milwaukee, Wisc.
Armstrong Machine Works, Three Rivers, Mich.
A. W. Cash Co., Decatur, Ill.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Elliott Co., Jeannette, Pa.
Fisher Governor Co., Marshalltown, Iowa
General Controls Co., Glendale, Calif.
Hubbell Corp., Mundelein, Ill.
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
James P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Menarth Mfg. Works, Inc., Philadelphia, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
Spartan Valve Co., St. Louis, Mo.
Spraying Systems Co., Bellwood, Ill.
Trane Co., LaCrosse, Wis.
York Corp., York, Pa.

STRAINERS, REFRIGERANT

Aircraft Production Engineers, Chicago, Ill.
Alco Valve Co., St. Louis, Mo.
Assd Chemical Co., Marinette, Wis.
AP Controls Corp., Milwaukee, Wis.
A. W. Cash Co., Decatur, Ill.
Dorsch, Gassman & Hessert, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
Henry Valve Co., Melrose Park, Ill.
Hubbell Corp., Mundelein, Ill.
Refrigerating Specialties Co., Chicago, Ill.
Spartan Valve Co., St. Louis, Mo.
Trane Co., LaCrosse, Wis.
The Wallace Mfg. Co., West Hartford, Conn.
York Corp., York, Pa.

STYROFOAM (See Insulation)

SUCTION PRESSURE REGULATOR (See Valves, Back Pressure)

SULPHUR DIOXIDE, ANHYDROUS (See Refrigerants)

SURGE TANKS (See Pressure Vessels)

SWITCHBOARDS

Electric Machinery Mfg. Co., Minneapolis, Minn.

SWITCHES AND CONTROLS

Clark Controller Co., Cleveland, Ohio
Harnischfeger Corp., Milwaukee, Wis.
Hubbell Corp., Mundelein, Ill.
Marsold Corp., Chicago, Ill.
Powers Regulator Co., Skokie, Ill.

SWITCHES, ELECTRIC (See also Controls; also Motor Controls and Starters; also Time Switches)

Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland, Ohio
General Controls Co., Glendale, Calif.
Harnischfeger Corp., Milwaukee, Wis.
J-B-T Instruments Inc., New Haven, Conn.
Marsold Corp., Chicago, Ill.
Mojonnier Bros. Co., Chicago, Ill.

TACHOMETERS

Bailey Meter Co., Cleveland, Ohio
Weston Electrical Instrument Corp., Newark, N. J.

TANKS (See also Pressure Vessels)

Augusta Iron & Steel Works, Inc., Augusta, Ga.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
California Steel Products Div. of Adsco Industries, Inc., Richmond, Calif.
Downingtown Iron Works, Inc., Downingtown Pa.
Doyle & Roth Mfg. Co. Inc., Brooklyn, N. Y.
Frick Co., Waynesboro, Pa.
Mojonnier Bros. Co., Chicago, Ill.
Schutte & Koerting Co., Cornwells Heights, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
J. E. Watkins Co., Maywood, Ill.
York Corp., York, Pa.

TANKS BRINE (See Brine Tanks)

TANKS, LATENT HEAT

Aircraft Production Engineers, Chicago, Ill.
Augusta Iron & Steel Works, Inc., Augusta, Ga.
California Steel Products Div. of Adsco Industries, Inc., Richmond, Calif.
Dole Refrigerating Co., Chicago, Ill.
Frick Co., Waynesboro, Pa.

The Kirk Stone Co., Chicago, Ill.
McCluny, Inc., Minneapolis, Minn.
Mojonnier Bros., Chicago, Ill.
Vilter Mfg. Co., Milwaukee, Wis.
Henry Vogt Machine Co., Louisville, Ky.
York Corp., York, Pa.

TANKS, MILK HOLDING

The Creamery Package Mfg. Co., Chicago, Ill.
Mojonnier Bros. Co., Chicago 64, Ill.
Refrigerating Specialties Co., Chicago, Ill.

TAPE INSULATING AND PRESSURE SENSITIVE (See Insulation Accessories)

TEMPERATURE CONTROLLERS, AUTOMATIC

Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
A. W. Cash Co., Decatur, Ill.
Central Engineering & Supply Co., Dallas, Texas
General Controls Co., Glendale, Calif.
Hubbell Corp., Mundelein, Ill.
Lees and Hartberg Co., Philadelphia, Pa.
James P. Marsh Corp., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
Mueller Instrument Co. Inc., Richmond Hill, N. Y.
Penn Instrument Div., Berger-Manning Co., Philadelphia, Pa.
Powers Regulator Co., Skokie, Ill.

TEMPERATURE RECORDING INSTRUMENTS (See Instruments Recording)

TESTING INSTRUMENTS (See Subject Type; also Electrical Line Equipment; also Water Treating Accessories, Etc.)

Bacharach Industrial Instrument Co., Pittsburgh, Pa.
Bailey Meter Co., Cleveland, Ohio
Hastings Instrument Co. Inc., Hampton, Va.
J-B-T Instruments Inc., New Haven, Conn.
James P. Marsh Corp., Skokie, Ill.
Weston Electrical Instrument Corp., Newark, N. J.
York Corp., York, Pa.

TEST CABINETS, LOW TEMPERATURE (See Low Temperature Test Cabinets)

THERMOMETERS (See Instruments, Recording)

THERMOMETERS, RECORDING (See Instruments, Recording)

THERMOSTATS AND PARTS (See also Controls)

AP Controls Corp., Milwaukee, Wis.
Barber-Colman, Rockford, Ill.
General Controls Co., Glendale, Calif.
Hubbell Corp., Mundelein, Ill.
Johnson Service Co., Milwaukee, Wis.
Marsold Corp., Chicago, Ill.
John H. Marvett, Inc., St. Albans, N. Y.
Partlow Corp., New Hartford, N. Y.
Powers Regulator Co., Skokie, Ill.

THERMOSTATIC EXPANSION VALVES (See Expansion Valves)

TIERING MACHINES (See Materials Handling)

TIME RECORDS (See Instruments, Recording)

TIME SWITCHES (See also Controls, also Switches, Electric)

Johnson Service Co., Milwaukee, Wis.
Paragon Electric Co., River Grove, Ill.
Reynolds Electric Co., River Grove, Ill.

TIMERS

Bailey Meter Co., Cleveland, Ohio
Marion Electrical Instrument Co., Manchester, N. H.
James P. Marsh Corp., Skokie, Ill.
Partlow Corp., New Hartford, N. Y.
Water Cooling Corp., New York, N. Y.

TOWERS, WATER COOLING (See Cooling Towers)

TRACK SLIDING DOOR (See Door Accessories and Hardware, Cold Storage)

TRANSFORMERS (See also Electrical Line Equipment)

General Controls Co., Glendale, Calif.
Wagner Electric Corp., St. Louis, Mo.
Weston Electrical Instrument Corp., Newark, N. J.

TRAPS, AIR, OIL, REFRIGERANT, STEAM, WATER

AP Controls Corp., Milwaukee, Wis.
Armstrong Machine Works, Three Rivers, Mich.
Frick Co., Waynesboro, Pa.
James P. Marsh Corp., Skokie, Ill.
Powers Regulator Co., Skokie, Ill.
Trane Co., LaCrosse, Wis.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

TROLLEYS, OVERHEAD CONVEYOR (See also Conveyors and Components)

Link-Belt Co., Chicago, Ill.
Manning, Maxwell & Moore, Inc., Muskegon, Mich.

TRUCKS, ELECTRIC (See Fork Lift Trucks)

TUBE CLEANERS

Elliott Co., Jeannette, Pa.
Elliott Co., Newark, N. J.
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
Oakite Products Inc., New York, N. Y.
Thomas C. Wilson, Inc., Long Island City, N. Y.

TUBE ICE MACHINES (See Ice Making Machines)

TUBES AND TUBING (See also Pipe)

Babcock & Wilcox Co., Beaver Falls, Pa.
Flexible Tubing Corp., Guilford, Conn.
National Tube Division, United States Steel Corp., Pittsburgh, Pa.
Republic Steel Corp., Cleveland, Ohio
Schutte & Koerting Co., Cornwells Heights, Pa.
Trent Tube Co., East Troy, Wis.
York Corp., York, Pa.

TUNNEL FREEZERS (See Freezers)

TURBO GENERATORS (See Electric Generating Plants)

UNDERCOATERS (See also Coatings and Compounds; also Finishes)

Alfred Hague & Co., Inc., Brooklyn, N. Y.
E. H. O'Neill Floors Co., Cicero, Ill.
Sealzit Co., Inc., New York, N. Y.
Southern Mfg. Co., St. Louis, Mo.
Tropical Paint Co., Cleveland, Ohio
Tuformix Co., Inc., Des Moines, Iowa

UNIT COOLERS (See Coils, Blower Units)

V-BELTS (See also Belts and Belting)

Belt-Ice Corp., Seattle, Wash.
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
Manny Mfg. Corp., Chicago, Ill.
Worthington Corp., Harrison, N. J.
York Corp., York, Pa.

VACUUM REFRIGERATION (See Ejectors)

VALVE DISCS, FLAPPERS, REEDS, WAFERS (See Compressor Parts & Accessories)

VALVES, AIR, STEAM, WATER

Automatic Switch Co., Orange, N. J.
Bailey Meter Co., Cleveland, Ohio
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Co., Decatur, Ill.
Clark Controller Co., Cleveland, Ohio
Fisher Governor Co., Marshalltown, Iowa
General Controls Co., Glendale, Calif.
Ice Plant Equipment Co. Inc., Philadelphia, Pa.
Johnson Service Co., Milwaukee, Wis.
Lunkenheimer Co., Cincinnati, Ohio
Manning, Maxwell & Moore, Inc., Stamford, Conn.
James P. Marsh Corp., Skokie, Ill.
Marsold Corp., Chicago, Ill.
Powers Regulator Co., Skokie, Ill.
Rockwell Mfg. Co., Pittsburgh, Pa.
Rupke-Wiegmann Mfg. Co., Salem, Mass.
Schutte & Koerting Co., Cornwells Heights, Pa.
York Corp., York, Pa.

VALVES, AMMONIA (See also Fittings, Ammonia)

Aircraft Production Engineers, Chicago, Ill.
Automatic Switch Co., Orange, N. J.

Dersch, Gossmin & Stewart, Inc., Chicago, Ill.
Frick Co., Waynesboro, Pa.
General Controls Co., Glendale, Calif.
J. & E. Hall, Ltd., Linde-Hall Canadian Refrigeration Div., Montreal, Que., CANADA
Hubbell Corp., Mandolain, Ill.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
James P. Marsh Corp., Skokie, Ill.
Marcold Corp., Chicago, Ill.
Cyrus Shank Co., Chicago, Ill.
Superior Valve & Fittings Co., Pittsburgh, Pa.
Vilter Mfg. Co., Milwaukee, Wis.
York Corp., York, Pa.

VALVES, AUTOMATIC CUT-OFF

AP Controls Corp., Milwaukee, Wis.
Fisher Governor Co., Marshalltown, Iowa
General Controls Co., Glendale, Calif.
Hubbell Corp., Mandolain, Ill.
The Marcold Corp., Chicago, Ill.
Schutte & Koerting Co., Cornwells Heights, Pa.
Cyrus Shank Co., Chicago, Ill.
Trane Co., LaCrosse, Wis.
York Corp., York, Pa.

VALVES, AUTOMATIC EXPANSION (See Expansion Valves)

VALVES, BACK PRESSURE (See also Controls, Pressure Actuated)

Alco Valve Co., St. Louis, Mo.
AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Dersch, Gossmin & Stewart, Inc., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
Hubbell Corp., Mandolain, Ill.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
Refrigerating Specialties Co., Chicago, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schnacke, Inc., Evansville, Ind.
Schutte & Koerting Co., Cornwells Heights, Pa.
Temperite Products Corp., Birmingham, Mich.
York Corp., York, Pa.

VALVES, CARBON DIOXIDE

Frick Co., Waynesboro, Pa.
Lunkenheimer Co., Cincinnati, Ohio
Marcold Corp., Chicago, Ill.
Rockwell Mfg. Co., Pittsburgh, Pa.
Superior Valve & Fittings Co., Pittsburgh, Pa.
York Corp., York, Pa.

VALVES, COMPRESSOR (See also Compressor Parts and Accessories)

Aircraft Production Engineers, Chicago, Ill.
Automatic Switch Co., Orange, N. J.
Frick Co., Waynesboro, Pa.
Henry Valve Co., Melrose Park, Ill.
Superior Valve & Fittings Co., Pittsburgh, Pa.
J. H. H. Voss Co. Inc., New York, N. Y.
York Corp., York, Pa.

VALVES, EXPANSION (See Expansion Valves)

VALVES, FLOAT, REFRIGERANT (See Controls, Float Valve)

VALVES, FLOAT, WATER (See Also Regulators, Flow)

Black, Sivalls & Bryson, Inc., Kansas City, Mo.
Fisher Governor Co., Marshalltown, Iowa
General Controls Co., Glendale, Calif.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
York Corp., York, Pa.

VALVES, MOTOR OPERATED

Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
Hubbell Corp., Mandolain, Ill.
Johnson Service Co., Milwaukee, Wis.
Lunkenheimer Co., Cincinnati, Ohio
Minne-Honton Regulator Co., Norwood, Mass.
Marcold Corp., Chicago, Ill.
Rockwell Mfg. Co., Pittsburgh, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schutte & Koerting Co., Cornwells Heights, Pa.

VALVES, PRESSURE RELIEF (See Pressure Relief Valves)

VALVES, PUMP

Automatic Switch Co., Orange, N. J.
Fisher Governor Co., Marshalltown, Iowa
York Corp., York, Pa.

VALVES, REGULATING

Aircraft Production Engineers, Chicago, Ill.
AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Barber-Colman Co., Rockford, Ill.
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Co., Decatur, Ill.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Dersch, Gossmin & Stewart, Inc., Chicago, Ill.
Fisher Governor Co., Marshalltown, Iowa
Garlock Packing Co., Palmyra, N. Y.
Hubbell Corp., Mandolain, Ill.
Johnson Service Co., Milwaukee, Wis.
James P. Marsh Corp., Skokie, Ill.
Minne-Honton Regulator Co., Norwood, Mass.
Powers Regulator Co., Skokie, Ill.
Refrigeration Specialties Co., Chicago, Ill.
Rockwell Mfg. Co., Pittsburgh, Pa.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Schutte & Koerting Co., Cornwells Heights, Pa.
York Corp., York, Pa.

VALVES, RELIEF (See Pressure Relief Valves)

VALVES, SAFETY (See Pressure Relief Valves)

VALVES, SOLENOID (See Solenoid Valves)

VAPOR SEALS (See Insulation Accessories; also Adhesives, Compounds, etc.)

VARIABLE SPEED TRANSMISSIONS (See Drives)

VENDING STATIONS, ICE

Ballard Sales Co., Fort Worth, Texas
K. G. Brewer Mfg. Co. Inc., Mattituck, N. Y.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Perfection Ice Scoring Machine Co., Fort Worth, Texas
Refrigeration Engineering Co., Minneapolis, Minn.
S & S Vending Machine Co., San Jose, Calif.

VESSELS, PRESSURE (See Pressure Vessels)

VIBRATION ABSORBERS (See Absorbers, Vibration)

VOLTMETERS (See also Electrical Line Equipment)

Alnerco Mfg. Co. Inc., Pittsburgh, Pa.
Marion Electrical Instrument Co., Manchester, N. H.
Weston Electrical Instrument Corp., Newark, N. J.

WASHERS, AIR (See Air Washers)

WATER AND BRINE TESTING AND TESTING EQUIPMENT

Dean Products, Inc., Brooklyn, N. Y.
Dearborn Chemical Co., Chicago, Ill.
Elgin Softener Corp., Elgin, Ill.
Feedwaters, Inc., New York, N. Y.
Frick Co., Waynesboro, Pa.
Hamilton Chemical Co., Los Angeles, Calif.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
International Salt Co. Inc., Scranton, Pa.
Permutit Co., New York, N. Y.
Water Treatment Engineers, Cleveland, Ohio
York Corp, York, Pa.

WATER COOLERS (See Chillers and Coolers)

WATER FILTERS (See Filters, Oil, Water)

WATER METERS (See also Meters, Flow)

Bailey Meter Co., Cleveland, Ohio
Penn Instrument Division, Burgess-Manning Co., Philadelphia, Pa.
Schutte & Koerting Co., Cornwells Heights, Pa.
Worthington Corp., Harrison, N. J.

WATER PROOFING MATERIALS (See Compounds and Coatings)

WATER REGULATING VALVES (See also Regulators, Flow)

Aircraft Production Engineers, Chicago, Ill.
AP Controls Corp., Milwaukee, Wis.
Bailey Meter Co., Cleveland, Ohio
Black, Sivalls & Bryson, Inc., Kansas City, Mo.
A. W. Cash Co., Decatur, Ill.
A. W. Cash Valve Mfg. Corp., Decatur, Ill.
Fisher Governor Co., Marshalltown, Iowa
Hubbell Corp., Mandolain, Ill.
Manning, Maxwell & Moore, Inc., Stratford, Conn.
James P. Marsh Corp., Skokie, Ill.
Powers Regulator Co., Skokie, Ill.
Ruggles-Klingemann Mfg. Co., Salem, Mass.
Refrigerating Specialties Co., Chicago, Ill.
York Corp., York, Pa.

WATER SOFTENERS AND PURIFIERS

Calgon, Inc., Pittsburgh, Pa.
Dearborn Chemical Co., Chicago, Ill.
Elgin Softener Corp., Elgin, Ill.
General Ozone Corp., Chicago, Ill.
Hamilton Chemical Co., Los Angeles, Calif.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
Oakite Products, Inc., New York, N. Y.
Permutit Co., New York, N. Y.
Water Treatment Engineers, Cleveland, Ohio
York Corp., York, Pa.

WATER TREATING MATERIALS

Anderson Chemical Co. Inc., Mason, Ga.
Barada & Page, Inc., Kansas City, Mo.
Barnsdey-Cheney Company, Columbus, Ohio
Carbide and Carbon Chemical Co., New York, N. Y.
Dearborn Chemical Co., Chicago, Ill.
Dow Chemical Co., Midland, Mich.
Elgin Softener Corp., Elgin, Ill.
Feedwaters, Inc., New York, N. Y.
International Salt Co. Inc., Scranton, Pa.
Oakite Products, Inc., New York, N. Y.
Pennsylvania Salt Mfg. Co., Philadelphia, Pa.
Permutit Co., New York, N. Y.
Solvay Process Div., Allied Chemical & Dye Corp., New York, N. Y.
Water Treatment Engineers, Cleveland, Ohio
Wright Chemical Corp., Chicago, Ill.

WATER AND BRINE TREATMENT

Anderson Chemical Co., Inc., Mason, Ga.
Aqua Electric Scale Control, Inc., Cleveland, Ohio
Aqua-matic Inc., Rockford, Ill.
Barada & Page, Inc., Kansas City, Mo.
Born Refrigerating Co., Chicago, Ill.
Calgon, Inc., Pittsburgh, Pa.
Columbia Southern Chemical Corp., Pittsburgh, Pa.
Dearborn Chemical Co., Chicago, Ill.
Elgin Softener Corp., Elgin, Ill.
Feedwaters, Inc., New York, N. Y.
General Ozone Corp., Chicago, Ill.
Hamilton Chemical Co., Los Angeles, Calif.
Ice Plant Equipment Co., Inc., Philadelphia, Pa.
International Salt Co. Inc., Scranton, Pa.
Jeffrey Mfg. Co., Columbus, Ohio
Oakite Products, Inc., New York, N. Y.
Permutit Co., New York, N. Y.
Saginaw Salt Products Co., Saginaw, Mich.
Water Treatment Engineers, Cleveland, Ohio
Wright Chemical Corp., Chicago, Ill.
Wyandotte Chemicals Corp., Wyandotte, Mich.
York Corp., York, Pa.

WATERPROOF PAINTS (See also Finishes; also Coatings and Compounds)

Amercoat Corp., Southgate, Calif.
Dearborn Chemical Co., Chicago, Ill.
Galveston Corp., Chemical Div., New York, N. Y.
Alfred Hague & Co., Inc., Brooklyn, N. Y.
Keppers Company Inc., Pittsburgh, Pa.
J. W. Mortell Co., Kankakee, Ill.
E. H. O'Neill Floors Co., Cicero, Ill.
Quigley Co., Inc., New York, N. Y.
Sherwin-Williams Co., Cleveland, Ohio
Stonhard Mfg. Co., St. Louis, Mo.
Tropical Paint Co., Cleveland, Ohio
TuCrete Co., Inc., Des Moines, Iowa

WATERPROOFING MATERIALS (See Coatings, Cements and Compounds)

WATTMETERS (See Meters, Electric, also Electrical Line Equipment)

WELDING EQUIPMENT & SUPPLIES

Alpha Metals, Inc., Jersey City, N. J.
Handy & Harman, New York, N. Y.
Harnischfeger Corp., Milwaukee, Wis.
Linde Air Products Co., Div. of Union Carbide & Carbon Corp., New York, N. Y.
Velocity Power Tool Co., Pittsburgh, Pa.
Worthington Corp., Harrison, N. J.

WELL EQUIPMENT AND ACCESSORIES

Calgon, Inc., Pittsburgh, Pa.

WIRE, WELDING (See Welding Equipment and Supplies)

WOOD PRESERVING AND SUPPLIES

Barada & Page, Inc., Kansas City, Mo.
Carbolineum Wood Preserving Co., Milwaukee, Wis.
Dow Chemical Co., Midland, Mich.
Keppers Company, Inc., Pittsburgh, Pa.
J. W. Mortell Co., Kankakee, Ill.
Quigley Co., Inc., New York, N. Y.
Wilbur & Williams Co., Brighton, Boston, Mass.

WROUGHT IRON PIPE (See Pipe and Tubing)

Manufacturer's Directory

with BRANCH OFFICES

REFER TO PAGE 33 FOR PRODUCT CLASSIFICATION

Acme Industries, Inc., 422 N. Mechanic St., Jackson, Mich.
Chicago, Ill., 230 E. Ohio St.
Houston 5, Texas, P.O. Box 6645
New York, N.Y., 2909 Lincoln Blvd.
New York, N.Y., 60 E. 42nd St.
Acme Paint Company Inc., 15 Park Row, New York.
Acme Protection Equipment Co., 1211 Kalamazoo St., South Haven, Mich.
Advanced Engineering Corp., 3802 W. North Ave., Milwaukee 8, Wis.
Aerofin Corporation, 1834-42 W. 95th St., Chicago 20, Ill.
Aircraft Production Engineers, 1234-42 W. 59th St., Chicago 36, Ill.
Aircoco Mfg. Co., Inc., 435 Bellwood St., Pittsburgh.
Alco Valve Co., 6427 Kingsland Ave., St. Louis, Mo.
Atlanta, Ga., 231 Healey Bldg.
Chicago, Ill., 4864 N. Broadway
Dedham, Mass., 57 Dresser Ave.
Fort Worth, Texas, 2937 Rufus St.
Los Angeles, Calif., 1430 Grande Vista Ave.
New Orleans, La., 2712 Green Acres Road, Metairie, La.
New York, N. Y., 80 West 42nd St.
Philadelphia, Pa., Land Title Bldg., Broad & Chestnut Sts.
Portland, Ore., 1218 S.E. 7th Ave.
San Francisco, Calif., 29 Sullivan St.
Seattle, Wash., 421 Michigan St.
Allegheny Ludlum Steel Corp., Oliver Bldg., Pittsburgh.
Allis Manufacturing Co., 1165 W. Grand Ave., Chicago 22, Ill.
Louis Allis Co., 427 E. Stewart St., Milwaukee 7.
Allis-Chalmers, Bush Division, 154th & Commercial Ave., Harvey, Ill.
Alpha Metals Inc., 56 Water St., Jersey City 4, N. J.
Alpha Piping, Inc., 14 Northfield Road, West Orange, N. J.
Amanco Corp., 4800 Firestone Blvd., Southgate, Calif.
American Blower Corp., Detroit 32, Michigan.
American Chemical Paint Co., Amber, Pa.
Detroit 23, Mich., 16228 W. McNichols Rd.
Hite, Calif., P.O. Box 648
Windsor, Ont., Canada, 2224 Walker Road
American Cyan Co., 368 Thomas St., Newark, N. J.
American Felt & Felt Co., Manufacturers Mart Plaza, Chicago 54, Ill.
American Marsh Pump, Inc., 60 Capital Ave. N. E., Battle Creek, Mich.
American Pipe Freezer Corp., 346 Border St., East Boston 28, Mass.
Anderson Chemical Co. Inc., 1630 Waterville Road, P.O. Box 1494, Kenova, W. Va.
Anod Chemical Co., 1 Stanton St., Marinette, Wis.
Detroit, Mich., 17164 Wyoming
Indianapolis, Ind., 409 N. College Ave.
Kansas City, Mo., 2309 Gilham Rd.
New York, N. Y., 60 E. 42nd St.
A-P Controls Corp., 2400 N. 32nd St., Milwaukee.
Apco Electric Eye Control, Inc., 2035 E. 22nd St., Cleveland 15, Ohio
Apco-Mosier, Inc., 2412 Great Am., Rockford, Ill.
Armite Laboratories, 6400 Bandini Blvd., Los Angeles 22.
Armour Automatic Div., Armour & Co., 1355 W. 31st St., Chicago 9, Ill.
Armstrong Cork Co., Lancaster, Pa.
Albany, N. Y., 260 Sprague St. at Northern Blvd.
Anchorage, Alaska, 5 Post Road
Atlanta, Ga., 727 W. Peachtree St., N. E.
Baltimore, Md., 114 South St.
Birmingham, Ala., 2300 Fourth Ave.
Boston 16, Mass., 131 Clarendon St.
Buffalo 23, N. Y., 1674 Kenmore Ave.
Charlotte 3, N. C., 2932 S. Griffith St.
Chicago 34, Ill., 6615 W. Irving Park Road
Cincinnati 3, Ohio, 130 E. Court St.
Cleveland 14, Ohio, 2979 Superior Ave.
Columbus 8, Ohio, 1280 Edgehill Road
Dallas 7, Tex., 1824 N. Industrial Blvd.
Denver 2, Colo., 14th & Lawrence Sts.
Detroit 26, Mich., 321 Lafayette Ave., West
Harrisburg, Pa., 1891 No. Cameron St.
Hartford 4, Conn., 830 Maple Ave.
Henderson, Ky., Third & Elm Sts.
Houston 3, Tex., 3111 Leeland Ave.
Indianapolis 2, Ind., 1320 Central Ave.
Jacksonville 3, Fla., P.O. Box 2027
Kansas City 6, Mo., 900 W. 26th St.
Los Angeles 15, Calif., 1206 Maple Ave.
Louisville 4, Ky., 961 Baxter Ave.
Memphis 3, Tenn., 201 Washington Ave.
Milwaukee 4, Wis., 1108 W. Bruce St.
Minneapolis 6, Minn., 4820 Hiawatha Ave.
Nashville 4, Tenn., 300—12th Ave.
New Orleans 12, La., 930-950 Tchoupitoulas St.
New York 16, N. Y., 295 Fifth Ave.
Philadelphia 2, Pa., 15th & Chestnut Sts.
Pittsburgh 22, Pa., 24th St. & Allegheny River
Portland 10, Ore., 2286 N. W. 31st Place
Providence 3, R. I., 111 Westminster St.
Richmond 25, Va., 1615 W. Broad St.
Rochester 4, N. Y., 328 Main St., East
St. Louis 5, Mo., 1206 Olive St.
San Francisco 3, Calif., 1965 Market St.
Seattle 4, Wash., 5035 First Ave.
Spokane 12, Wash., North 1318 Maple St.
Tulsa 3, Okla., 219 E. Archer St.
Washington 7, D.C.
Wilmington 7, Del., 925 Market St.
Armstrong Machine Works, 816 Maple St., Three Rivers, Mich.
Augusta Iron & Steel Works, Inc., 606 Eleventh St., Augusta, Georgia
Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.
Automatic Transportation Co., 161 W. 87th St., Chicago 20, Ill.

Babcock & Wilcox Co., Tubular Products Div., Beaver Falls, Penna.
Bacharach Industrial Instrument Co., 7301 Penn Ave., Pittsburgh 8, Penna.
Bahnson Co., Winston-Salem, N. Car.
Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10.
C. Tom Baker, 1070 Spring St., N.W., Atlanta, Ga.
Baldwin-Hill Co., 860 Brumby Ave., Trenton 2, N. J.
Chicago, Ill., 600 So. Michigan Ave.
Huntington, Ind., 701 North Broadway
New York, N. Y., 500 Fifth Ave.
Temple, Tex., 702 E. French St.
Ballard Sales Company, P.O. Box 1121, Fort Worth.
Baltimore Aircoil Company, Inc., 2615 Madison St., Baltimore 18, Md.
Band-It Company, 2550 Walnut St., Denver 5, Colo.
Barada & Page, Inc., Galeotia & Bluehaven Ave., Kansas City 20, Mo.
Corpus Christi, Tex., 1509 N. Tancahua
Dallas 10, Tex., Third & Bartch Sts.
Houston 7, Tex., 2812 Center St.
New Orleans 16, La., Maple & Leake Aves.
Odessa, Tex., 128 S. Grandview Ave.
Oklahoma City 1, Okla., 1700 W. Grand Ave.
St. Louis 7, Mo., Foot of Destrehan St.
Tulsa 3, Okla., 26 No. Guthrie
Wichita 4, Kans., 2041 No. Mosley Ave.
Barber-Coleman Co., 1300 Rock St., Rockford, Ill.
Barnabey-Cheney Co., Cassaday at Eighth, Columbus 19, Ohio
Los Angeles 7, Calif., 600 West 54th St.
Barrett Sunlight Paint Co., Providence 2, Rhode Island
Barrett-Cravens Co., 650 Dundee Road, Northbrook, Ill.
Barry Controls, Inc., 700 Pleasant St., Watertown, Mass.
Fred C. Barton, 919-923 K. of P. Bldg., Indianapolis 4, Ind.
Bastenon Ice Processing Equipment, Mineral Wells, Texas
Bell-Ice Corp., 3480—146th W., Seattle 9, Wash.
Bemis Brothers Bag Co., 408 Pine St., St. Louis 2.
Beta Fog Nozzle Inc., 349 Wells St., Greenfield, Mass.
H. E. Bigstar & Associates, Inc., 700 Griswold Bldg., Detroit, Mich.
Binks Manufacturing Co., 9114-44 W. Carroll Ave., Chicago 12, Ill.
Homer D. Bird, 4068 Zenith Ave., N., Minneapolis.
Black, Stealth & Byron, Inc., 7300 E. 12th St., Kansas City 26, Mo.
Samuel C. Bloom, 1983 E. 72nd St., Chicago, Ill.
Bohn Refrigerating Co., 68 E. Jackson Blvd., Chicago.
Henry Bower Chemical Mfg. Co., 2915 Gray's Ferry Road, Philadelphia 46, Pa.
Boyce B. Bright Co., 2615—12th St., Detroit 16.
K. G. Brown Mfg. Co. Inc., Wellman Ave., Mattituck, New York
Bush Mfg. Co., 179 South St., West Hartford, Conn.
Chicago 7, Ill., 1458 W. Congress St.
New York 17, N. Y., 250 E. 43rd St.
Riverside, Calif., 1060 Massachusetts Ave.
A. M. Byers Co., 717 Liberty Ave., Pittsburgh 22.
Bushings Inc., 4360 Gallup Highway, Royal Oak, Mich.
Butcher Boy Refrigerator Door Co., Harvard, Ill.

Calgon, Inc., 323 Fourth Ave., Pittsburgh 22, Pa.
California Steel Products Div. of Adams Industries Inc., Barrett Ave and "A" St., Richmond, Calif.
Callender Engineering Co., Third & Union, Seattle 2.
Cambridge Engineering Co., P.O. Box 218 F, Bloomfield, N. J.
Carnes Fabricators, Inc., 860 W. Lake St., Chicago.
Carnes Products Co., 4843-51 Vineyard Ave., Kansas City, Mo.
Carbide and Carbon Chemicals Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
Carbolineum Wood Preserving Co., 3800 W. Highland Ave., Milwaukee 3, Wis.
The Carney Company, Inc., P.O. Box 30, Mankato, Minn.
Carrier Corp., 300 S. Geddes St., Syracuse 1, N. Y.
Atlanta, Ga., 2015 Peachtree Road, N.W.
Boston 14, Mass., 150 Causeway St.
Charlotte 3, N. C., 2610 South Blvd.
Chicago 54, Ill., 222 North Bank Drive.
Cincinnati 6, Ohio, 2986 Woodburn Ave.
Cleveland 14, Ohio, 2200 Superior Ave.
Clifton, N. J., 1051 Bloomfield Ave.
Dallas 1, Tex., 710 So. Harwood St.
Denver 4, Colo., 660 Bannock
Detroit 26, Mich., 409 Griswold St.
Houston 2, Tex., 916 Electric Bldg.
Jacksonville 7, Fla., 1974 San Marco Blvd.
Kansas City 5, Mo., 13 W. 10th St.
Los Angeles 22, Cal., 5330 Harbor St.
Memphis 3, Tenn., 563 Manufacturers & Mercantile Bldg.
Minneapolis, Minn., 12 So. 6th St.
New Orleans 12, La., 707 Industries Bldg.
New York 17, N. Y., 365 Madison Ave.
Philadelphia 7, Pa., 12 So. 12th St.
Phoenix, Ariz., 114 W. Adams St.
Pittsburgh 22, Pa., 1406 First Nat'l. Bank Bldg.
Portland 4, Oreg., S. E. Grand at Morrison
Richmond 19, Va., 1408 Central Nat'l. Bank Bldg.
Rochester 14, N. Y., 14 Main St., East
San Francisco 7, Cal., 900 Tennessee St.
St. Louis 8, Mo., 3007 Washington Ave.
Syracuse 2, N. Y., 214 E. Fayette St., Rm. 400
Washington 5, D. C., 930 Investment Bldg.
Caterpillar Tractor Co., Peoria 8, Ill.
Decatur, Ill.
Joliet, Ill.
Milwaukee, Wis.
San Leandro, Cal.
York, Pa.
Carter Pump Co., 1604 Hanley Ave., Muscatine, Iowa
A. W. Cash Co., 540 N. 18th St., Decatur, Ill.
A. W. Cash Valve Manufacturing Corp., 646 E. Wabash Ave., Decatur, Ill.
Chase Cold Storage Door Co., Reading, Pa.
Central States Paper & Bag Co., 2221 Hazard Bridge Ave., St. Louis 20, Mo.
The Chatfield & Woods Seat Co., Ashor Place, Hyde Park, Cincinnati 8, Ohio
Chicago Blower Corporation, 9867 Pacific Ave., Franklin Park, Ill.
Chicago Metallic Mfg. Co., 1997 Clybourn Ave., Chicago 14, Ill.
Chip Ice Corporation, 1842 W. 97th St., Chicago 34.
Chicago Pen Company, Kalamazoo 16, Mich.
Clark Controller Co., 1146 E. 152nd St., Cleveland.
Clark Door Co., Inc., 585 Hagerding St., Hewitt, S.
The Cleveland Electric Motor Co., 5213 Center Ave., Cleveland 3, Ohio
Colombelle Division, Union Asbestos & Rubber Co., 2900 W. Vermont St., Elm Island, Ill.
Cel-Flake Corporation, 2446 S. Ashland Ave., Chicago.
The Colson Corp., Caster & Floor Sts., Elyria, Ohio
Columbia Electric Mfg. Co., 4839 Hamilton Ave., Cleveland 14, Ohio
Columbia Southern Chemical Corp., 1 Gateway Center, Pittsburgh 22, Pa.
Continental Motors Corp., 288 Market St., Muskegon, Mich.
Corning Glass Works, Corning, N. Y.
Crane Packing Company, 1800 Cuyler Ave., Chicago 13, Ill.
Creamery Package Mfg. Co., 2343 W. Washington Blvd., Chicago 7, Ill.
Atlanta 3, Ga., 471 Glen Iris Drive, N.E.
Boston 24, Mass., 136 Washington St., N.
Buffalo 2, N. Y., 33 Elliott St.
Chicago 7, Ill., 1243 W. Washington Blvd.
Dallas 2, Tex., 1710 N. Market St.
Denver 2, Colo., 1851 Lawrence St.
Houston 3, Tex., 1116 Naple
Kansas City 1, Mo., 1408 W. 12th St.
Los Angeles 23, Cal., 2985 E. 11th St.
Memphis 3, Tenn., 619 Jefferson Ave.
Minneapolis 1, Minn., 215—2nd St., S.
Nashville 10, Tenn., 90 Franklin St.
New York 24, N. Y., 500 Fifth Ave.
Omaha 8, Neb., 112 S. Tenth St.
Philadelphia 32, Pa., 2715 N. Broad St.
Portland 9, Ore., 33 N. W. Front Ave.
St. Louis 8, Mo., 4710 Delmar Blvd.
Salt Lake City 1, Utah, 202 W. Broadway
San Francisco 3, Cal., 1201 Howard St.
Seattle 4, Wash., 1030 First Ave., So.
Toledo 4, Ohio, 800 Broadway
Waterloo, Iowa, 406 Sycamore St.

Dean Products, Inc., 1042 Dean St., Brooklyn 38.
Dearborn Chemical Co., Manufacturers Mart Plaza, Chicago 54, Ill.
The Dening Company, Salem, Ohio
Detrick, Gamble & Hamer, Inc., 4849 W. Grand Ave., Chicago 39, Ill.
Detroit Controls Corp., 5960 Tireman Ave., Detroit.
Detroit Steel Products Co., Central Motor Div., 13400 W. Outer Drive, Detroit 28, Mich.

Detroit Hoist and Machine Co., 8200 Hoover St., Detroit 13, Mich.
Detroit Ice Machine Co., 2615 Twelfth St., Detroit 16, Mich.
Bruce Enginn and Company, 20th & Wyandotte St., Kansas City 41, Mo.
Dole Refrigerating Company, 5710 N. Pulaski Road, Chicago 32, Ill.
The Dow Chemical Co., Midland, Mich.
Doyle & Roth Mfg. Co., Inc., 136-50 Twenty-fourth St., Brooklyn 32, N. Y.
Dravosburg Iron Works Inc., 194 Wallace Ave., Dravosburg, Pa.
Dynamic Gears, 212 N. Fairfax St., Alexandria, Va.
E. I. du Pont de Nemours & Co., Electrochemicals Dept., Wilmington 98, Del.
New York 13, N. Y., 40 North St.
Chicago 3, Ill., 7 So. Dearborn St.
Los Angeles 58, Calif., 2930 E. 44th St.
E. I. du Pont de Nemours & Co., Kinetic Chemicals Div., Wilmington 98, Del.
Duramatic Corp., 2589 Factory St., Kalamazoo, Mich.

The Electric Auto-Lite Co., Instrument & Gauge Div., 1201 Champlain St., Toledo 1, Ohio
The Electric Controller & Mfg. Co., 4204 Lee Road, Cleveland 28, Ohio
Electric Machinery Mfg. Co., Minneapolis 13, Minn.
Elgin Softener Corp., 124 N. Grove Ave., Elgin, Ill.
Elliott Co., Jeannette, Pa.
Elliott Co., Ross Div., 145 Sumer Ave., Newark.
A. Ellwein & Sons, Inc., 2011 W. Pershing Road, Chicago, Ill.
Exide Industrial Div., Electric Storage Battery Co., 42 S. 15th St., Philadelphia 2, Pa.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Ill.
Fanstecl, Inc., 140 Cedar St., New York 6, N. Y.
Fisher Governor Company, Marshalltown, Iowa
Flexible Tubing Corp., Guilford, Conn.
Los Angeles, Calif., 12230 W. Olympic Blvd.
Flexonics Corp., 1400 S. Third Ave., Maywood, Ill.
Food Machinery & Chemical Corp., Canning Machinery Div., 333 West Julian St., San Jose, Calif.
Hoopeston, Ill., 103 E. Maple St.
The Foster Corporation Ltd., 2500 South Atlantic Blvd., Los Angeles, Calif.
Frick and Reichert Co., 321 Holliday St., Baltimore 2.
Fuel Refrigerator Co., 2400 Eadon St., Philadelphia 37, Pa.
Freezing Equipment Sales Inc., 423 W. Market St., York, Pa.
Fretz-Moon Tube Company, Inc., P.O. Box 353, Butler, Penna.
Frick Co., Waynesboro, Pa.
Atlanta, Ga., 1009-A Mortgage Guarantee Bldg.
Boston 10, Mass., 419 Commonwealth Ave.
Charlotte 3, N. C., 1013 Independence Bldg.
Cincinnati 2, Ohio, 3708 Carew Tower
Dallas 1, Tex., 806 Tower Petroleum Bldg.
Kansas City 6, Mo., 611 Merchandise Mart Bldg.
Los Angeles, Cal., Rm. 702, 656 S. Los Angeles St.
Memphis 3, Tenn., 1012 Stavich Bldg.
New Orleans, La., 238 Humble Bldg.
New York 17, N. Y., 370 Lexington Ave.
Oklahoma City 3, Okla., 127 N. W. 13th St.
Polatka, Fla., 113 Abstract Bldg.
Philadelphia 7, Pa., 614 Witherspoon Bldg.
Pittsburgh 22, Pa., 904 Empire Bldg.
St. Louis, Mo., 320 N. Fourth St.
Washington 5, D. C., 1330-31 Shoreham Bldg.

Gehnan Corp., Chemical Div., 40 W. 29th St., New York 1, N. Y.
Cary B. Gamble & Associates, 605 Commercial Place, New Orleans 12, La.
The G & O Manufacturing Company, 130 Winchester Ave., New Haven 8, Conn.
The Garlock Packing Co., Palmyra, N. Y.
James Gayer & Associates, Wentworth-Smith Bldg., Second St., San Francisco, Calif.
General Chemical Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y.
Albany 5, N. Y., Railroad Ave.
Atlanta 3, Ga., 133 Carnegie Way, N.W.
Birmingham 1, Ala., P.O. Box 989
Buffalo 2, N. Y., 1 W. Genesee St.
Charlotte 1, N. C., 818 Tuckaseegee Rd.
Chicago 32, Ill., 5937 W. 47th Pl.
Cleveland 14, Ohio, 850 Euclid Ave.
Denver 9, Colo., 1271 W. Bayaud Ave.
River Rouge 18, Mich., 800 Marion Ave.
Houston 1, Tex., 2202 Dallas Ave.
Los Angeles 5, Calif., 2999 W. Sixth St.
Minneapolis 13, Minn., 2020 Broadway St., N.E.
Philadelphia 7, Pa., 12 So. 12th St.
Pittsburgh 19, Pa., 499 Seventh Ave.
Providence 1, R. I., 88 Weybosset St.
San Francisco 4, Calif., 235 Montgomery St.
Seattle 1, Wash., 1326 Fifth Ave.
St. Louis 3, Mo., 1221 Locust St.
Gay Engineering Corporation, 2960 E. Eleventh St., Los Angeles 23, Calif.
Samuel S. Gelber Co., 162 N. Clinton St., Chicago.
General Controls Co., 801 Allen Ave., Glendale 1, Calif.
General Ozone Corporation, 315 N. Aberdeen St., Chicago 7, Ill.
Gemmit & Sons, Inc., Main St., Richmond, Indiana.
The Gerlo Corp., Neptune Hwy., Neptune City, N. J.
Gilford-Wood Co., 1 Madison Ave., Madison, N. Y.
Chicago 6, Ill., 360 W. Washington St.
New York 17, N. Y., 420 Lexington Ave.
St. Louis 1, Mo., 1042 Railway Exchange Bldg.
Goodyear Rubber Co., Inc., 1144 E. Market St., Akron 16, Ohio
Gorton Pumps, Inc., 300 Fall St., Seneca Falls, N. Y.
Grand Rapids Varnish Corp., 1360 Steel St., S.W., Grand Rapids, Mich.
Van R. H. Greene, 11 Park Place, New York 7, N. Y.

Alfred Hague & Co. Inc., 227—24th St., Brooklyn.
J. & E. Hall Ltd., Lindo-Hall Canadian Refrigeration Div., 2021 Cote de Liesse E. Road, Montreal 9, Que., Canada.
Hallen Manufacturing Co., 1681 W. Florence Ave., Inglewood, Calif.
Handy & Harman, Bridgeport 1, Conn.
Henry Hanken Co., 407 Hampden Ave., Minneapolis 2, Minn.
Hansen Laboratory Corporation, 4480 W. National Ave., Milwaukee 46, Wis.
Hardinge Mfg. Corp., 701 Avon St., N.W., Grand Rapids 2, Mich.
Chicago, Ill., 105 S. LaSalle St.
Detroit, Mich., 719 Griswold St.
White Plains, N. Y., 175 Main St.
Harris Refrigeration Co., 365 Walden St., Cambridge, Mass.
Hastings Instrument Company, Inc., Monacan Ave., Hampton, Virginia
H. A. Hautmann & Sons, 2820 Lucas Ave., St. Louis.
Hawes Structural Steel Co., 1715 Crystal Ave., Kansas City 26, Mo.
Hawkins Chemical Company, 2056 E. 7th Place, Los Angeles 21, Calif.
Henry Valve Co., 5215 North Ave., Melrose Park, Ill.
New York 17, N. Y., 70 E. 45th St.
Hamilton Beach & Cramlich, 59 E. Van Buren St., Chicago, Ill.
Hercules Motors Corp., 101 Eleventh St., Canton 2, Ohio
Hendricks-Hershey of Indiana, Inc., 300 Indianapolis Ave., Lebanon, Ind.
E. F. Hewitson & Co., 305 W. Lehigh Ave., Philadelphia 33, Pa.
Hoke Inc Machine Company, 2025 Montrose Ave., Chicago 18, Ill.
Holdell Corp., Hawley Road, Box H-700, Mansfield, Ill.
Homer Manufacturing Company, 1550 E. 17th St., Cleveland 14, Ohio
Hyster Company, 2168-51 N. E. Clackamas St., Portland 8, Ore.

Ice Plant Equipment Co. Inc., 2543 Frankford Ave., Philadelphia 25, Penna.
The Ideal Electric & Mfg. Co., E. First St., Mansfield, Ohio
Industrial Mfg. & Engineering Co., 3600 W. Belmont Ave., Chicago 18, Ill.
J-B-T Instruments Inc., 441 Chapel St., New Haven 12, Conn.
International Salt Co. Inc., Scranton 2, Pa.
Ironfire Sales Co., 947 Broadway, Richmond City, Calif.
San Francisco, Calif., 785 Market St.

Jamison Cold Storage Door Co., Box 70, Hagerstown, Md.
Chicago 10, Ill., 500 N. Dearborn St.
Los Angeles 21, Calif., 737 Terminal St.
New York 36, N. Y., 11 West 42nd St.
Omaha 2, Neb., 1114 WOW Bldg.
The Jeffrey Mfg. Co., 781 N. 4th St., Columbus 16, Ohio
Jorgensen Gage and Valve Co., 89 Fellowsy, Somerville 45, Mass.
Johnson Service Co., 507 East Michigan Ave., Milwaukee 1, Wis.

Thomas C. Kendall, 1366 S. Boyle Ave., Los Angeles 23, Calif.
Kennard Corporation, 1619 S. Hanley Road, St. Louis.
Walter Kidde & Co., Inc., 1140 Main St., Belleville 9, N. J.
Koppers Co., Inc., Koppers Bldg., Pittsburgh 19, Pa.
The King Company, 402-10 N. Cedar St., Owosso, Mich.
The King Zero Company, 4300 W. Montrose Ave., Chicago 41, Ill.
Knickerbocker Stamping Co., Parkersburg, W. Va.
The Kortland Company, Inc., 46-13 32nd Place, Long Island City 1, N. Y.
Kramer Trenton Co., Olden and Brandy Ave., Trenton 5, N. J.

LaCrosse Cooler Co., 2809-17 Losey Blvd., LaCrosse, Wis.
Ladish Co., 5409 S. Packard, Cudahy (Milwaukee).
Lake Chemical Co., 3022 W. Carroll Ave., Chicago.
Lancaster Pump and Manufacturing Co. Inc., P.O. Box 778, Manheim Pike, Lancaster, Pa.
Lawrence Pump & Engine Co., Canal & Marston Sts., Lawrence, Mass.
Layne & Bowler Co., Memphis, Tenn.
Leeds & Northrup Co., 4970 Stenton Ave., Philadelphia 44, Pa.
The Lear Mfg. Co., 181 Adams St., New Lisbon, Wis.
Lebel Division, Westinghouse Air Brake Company, 1700 S. 60th St., Milwaukee 14, Wis.
Chas. S. Lewis & Co., Inc., 5685 Grant Road, St. Louis 23, Mo.
Lewis-Shepard Products, Inc., 186 Walnut St., Watertown, Mass.
Libbey-Owens-Ford Glass Co., 608 Madison Ave., Toledo 3, Ohio
Lilie-Hoffmann Cooling Towers, Inc., 1480 S. Vandeventer Ave., St. Louis 10, Mo.
The Lilly Co., 466 Union Ave., Memphis 1, Tenn.
Linde Air Products Co., Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17.
Link-Belt Company, 307 N. Michigan Ave., Chicago 1, Ill.
Lipman Div., Yates American Machine Co., Beloit, Wis.
E. L. Lewis & Co., Gastonia, No. Car.
The Lunkenheimer Co., Eastern St. & Waverly Ave., Cincinnati 14, Ohio

Mabbs Hydraulic Packing Company, 431 S. Dearborn St., Chicago 5, Ill.
Madsenia Company, 125 Cedar St., New York 6, N. Y.
Mahogany Importing Company, 725 South Spring St., Los Angeles 14, Calif.
Manning, Maxwell & Moore Inc., 230-250 E. Main St., Stratford, Conn.
Manning, Maxwell & Moore, Inc., Muskegon, Mich.
Marion Electrical Instrument Co., Crosier Field, Manchester, N. H.
Marion Glass Mfg. Co., Box 447, Marion, Ohio
The Marley Co., 222 W. Gregory Blvd., Kansas City.
James P. Marsh Corp., 3501 Howard St., Skokie, Ill.
Mason-Neilan Regulator Co., Norwood, Mass.
John H. Matthews & Sons, Ferris Ave., North Arlington, N. J.
Maurey Mfg. Corp., 2107-23 South Wabash Ave., Chicago 16, Ill.
Kenneth G. McCray, 74 New Montgomery St., San Francisco, Calif.
McCray Inc., 1400 Broadway, N.E. Minneapolis 13.
The Meredith Corp., 4321 Belmont Ave., Chicago 41, Ill.
New York 17, N. Y., 205 E. 42nd St.
Philadelphia 32, Pa., 3127 N. Broad St.
Mercury Manufacturing Co., 4044 South Halsted St., Chicago 9, Ill.
Franklin F. Miller & Son, Inc., 36 Meadow St., East Orange, N. J.
Miracle Adhesives Corp., 214 E. 53rd St., New York 22, N. Y.
Mixing Equipment Co. Inc., 135 Mt. Read Blvd., Rochester 11, N. Y.
MMM, Inc., 1315 Hutchins, Houston 1, Texas
Moeller Instrument Company, Inc., 132nd St. & 89th St., Richmond Hill 18, N. Y.
Mojonnier Bros. Co., 3401 W. Ohio St., Chicago 44.
Molleenberg-Betz Mach. Co., Inc., 20-26 Henry St., Buffalo 2, New York
Monarch Mfg. Works, Inc., 2501 E. Ontario St., Philadelphia 34, Pa.
Montgomery Elevator Co., Moline, Illinois
Gordon E. Moore, Inc., 2811 N. Vermilion St., Danville, Ill.
Stanley E. Morris Co., 5504 Alhambra Ave., Los Angeles 32, Calif.
J. W. Mortell Co., 550 N. Hobbie Ave., Kankakee, Ill.
Detroit, 34, Mich., P.O. Box 4665, Mt. Elliott Sta.
Lyndhurst, N. J., Page & Schuyler Avenues
The Mote-Tron Company, 1953 E. 96th St., Cleveland 3, Ohio
Mundet Cork Corporation, 7101 Tonnelle Ave., North Bergen, N. J.
John H. Murphy, Inc., 112-06 Farmers Blvd., St. Albans 12, N. Y.
Myrtle Adhesive Products, 2635 N. Kildare, Chicago.
Nash Engineering Co., South Norwalk, Conn.
National Cork Company, One Eagle Street, Englewood, N. J.
National Pellet Corporation, 947 Oliver Bldg., Pittsburgh 22, Pa.
The National Pipe Bending Co., 162 River St., New Haven 19, Conn.
National Radiators Inc., 5100 San Francisco Ave., St. Louis, Mo.
National Tube Division, United States Steel Corp., 525 William Penn Place, Pittsburgh 30, Pa.
Nelson Wide Supplies, Inc., 1353 N. W. 29th St., Miami, Fla.
Niagara Blower Company, 405 Lexington Av., New York 17, N. Y.
Nitrogen Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.
Atlanta 3, Ga., 133 Carnegie Way, N.W.
Columbia, Mo., 20-A So. 9th St., P.O. Box 186.
Columbia 1, So. Car., 1201 Sovrels St.
Hopewell, Va., P.O. Box 121
Indianapolis 20, Ind., 6060 College Ave.
Ironton, Ohio P.O. Box 98
Kalamazoo, Mich., 511 E. Paterson St.
Los Angeles 5, Calif., 5999 West 6th St.
Omaha 7, Neb., P.O. Box 166
Orange, Texas, P.O. Box 2041
San Francisco 3, Calif., 1095 Market St.
Nor-Lake, Inc., Hudson, Wis.

Oakite Products, Inc., 29 Rector St., New York 6.
Ohio Galvanizing & Mfg. Co., Ann St., Niles, Ohio
E. H. O'Neill Floors Co., 2525 S. 50th Ave., Cicero, Ill.
Dallas, Texas, 1412 Jefferies St.
Houston, Texas, 1315 Hutchins St.
Long Island City, N. Y., 29-28 41st Ave.
Minneapolis, Minn., 20 Lakeside Ave.
New Orleans, La., 4048 Thalia St.
Portland, Oregon, 61 S. E. Yamhill St.
San Francisco, Calif., 178 Townsend St.
Fred Oplatz & Associates, 112 W. 42nd St., New York 36, N. Y.
Owens-Corning Fiberglas Corp., Madison & Huron, Toledo 1, Ohio
Albuquerque, N. M., 1011 Sawmill Road, N.W.
Atlanta 3, Ga., 1003-1008 Whitehead Bldg.
Baltimore 1, Md., Room 206, Baltimore Life Bldg.

Birmingham, Ala., 1327½ First Ave., S.
Boston 16, Mass., 608 Statler Office Bldg.
Buffalo 2, N. Y., 401 Hodge Bldg.
Charleston, W. Va., 913 Dawson Bldg.
Chicago 1, Ill., 2626 Pure Oil Bldg.
Cincinnati 4, Ohio, Room 1107, 2330 Victory Pky.
Cleveland 15, Ohio, 815-827 Hanna Bldg.
Columbus 15, Ohio, 2110 Lovejoy-Lincoln Tower
Dallas 4, Texas, 1101 United Bankers Life Bldg.
Dayton 2, Ohio, 1202 N. Ludlow St.
Denver 4, Colo., 475 Acoma St.
Detroit 2, Mich., 814-817 New Center Bldg.
Ft. Wayne, Ind., 255 Central Bldg.
Gary, Ind., 509-10th St., Chesterton, Ind.
Grand Rapids 2, Mich., 424 McKay Tower
Greensboro, N. C., 221 Watson Bldg.
Greenville, S. C., 216 Capers Bldg.
Harrisburg, Pa., 1601 N. Front St.
Hartford, Conn., 988 Asylum Ave., Room 206.
Houston 19, Texas, 1934 West Gray St.
Indianapolis 4, Ind., 617 Architects & Builders Bldg.
Jacksonville, Fla., Room 418, Atlantic Natl. Bank Bldg.
Kansas City 10, Mo., 2510 Power and Light Bldg.
Knoxville, Tenn., 404 Burwell Bldg.
Los Angeles 5, Calif., 5440 W. Eighth St.
Louisville 2, Ky., Room 1164, Starks Bldg.
Memphis, Tenn., 814 Dermon Bldg.
Miami, Fla., Box 987, Coral Gables, Fla.
Milwaukee 3, Wis., 7140 Plankinton Bldg.
Minneapolis 2, Minn., 1700 Rand Tower.
Mobile, Ala., P.O. Box 990
Newark 2, N. J., 1023 Broad St.
New Orleans 12, La., 507 Pan-American Life Ins. Bldg.
New York 22, N. Y., 16 East 54th St.
Norfolk, Va., 610 W. 21st St.
Omaha, Nebr., 230 Keeline Bldg., 17th & Harney.
Peoria, Ill., 700 First Natl. Bank Bldg.
Philadelphia 2, Pa., 1616 Walnut St. Bldg. Rm. 2115-6
Phoenix, Ariz., 1800 W. Fillmore St.
Pittsburgh, Pa., 621 Gateway Center Bldg. No. 2.
Portland 4, Oregon, 1044 Pacific Bldg.
Richmond 19, Va., 1010 Central Natl. Bank Bldg.
Sacramento 14, Calif., 1618 Thornton Ave.
St. Louis 1, Mo., 1006 Olive St.
Salt Lake City, Utah, 336 South Third St.
San Antonio, Texas, 535 Slaw Moore Bldg.
San Diego 1, Calif., 2040 Fifth Ave.
San Francisco 7, Calif., 1390 — 17th St.
San Jose 10, Calif., San Jose Builders' Exch.
Savannah, Ga., 11314 E. Harris St.
Seattle 4, Wash., 1077 Dexter Horton Bldg.
Spokane, Wash., 5044 E. Trent Ave.
Syracuse, N. Y., Syracuse-Kemper Bldg.
Tampa, Fla., P. O. Box 620.
Toledo 3, Ohio, 842 National Bank Bldg.
Tulsa, Okla., 902 American Airlines Bldg.
Washington 6, D. C., Rm. 203, 806 Connecticut Ave. N. W.

The Pacific Lumber Co., 100 Bush St., San Francisco 4, Calif.
Paramount, Calif., 406 Hendrix Ave.
Lookout Mountain, Tenn., Aladdin Rd., Fairyland.
Pelton, Inc., 40 W. 57th St., New York City 19.
Peltzer, Incorporated, 44 Pearl, Hudson Falls, N. Y.
Penguin Electric Co., 1501 Twelfth St., Two Rivers, Wis.
Penn-Cramer Co., Newport St., Fitchburg, Mass.
Perfect Circle Corp., 2 Dunham Road, New Hartford, N. Y.
Penn Instrument Div., Burgess-Manning Co., 4118 Haverford Ave., Philadelphia 4, Pa.
Pennsylvania Salt Manufacturing Company, 3 Penn Center Plaza, Philadelphia 2, Pa.
Perfection Ice Shaving Machine Co., P. O. Box 2140, Fort Worth, Texas.
Permanite Corp., 2282 South LaSalle St., Chicago 1.
The Permutit Co., 330 W. 42nd St., New York 36.
Manuel H. Peterson, 401 Miller Bldg., Yakima, Wash.
H. A. Phillips & Co., 2828 W. Carroll Ave., Chicago 24, Ill.
Pittsburgh Gauging Corporation, Gas Gauging Gauge, Pittsburgh 22, Pa.
Chicago 6, Ill., Room 1214, 205 W. Wacker Dr.
Kansas City 5, Mo., Room 208, 101 W. 11th St.
New York 17, N. Y., 379 Fifth Ave.
Philadelphia 3, Pa., Rm. 1205, 123 S. 19th St.
Powers Regulator Co., 3400 Oakton St., Skokie, Ill.
Prentice Engineering Company, 3730 Chouteau Ave., St. Louis 10, Mo.
J. F. Pritchard & Co. of California, 4425 Roanoke Parkway, Kansas City 12, Mo.

Quigley Co. Inc., 227 — 9th Ave., New York 17, N. Y.

The Rapids-Standard Co. Inc., 130 Trowbridge N. W., Grand Rapids 2, Mich.
Rasey Products Co., 1232 Second Street, N. E., Canton 2, Ohio
Refrigerating Specialties Co., 3084 W. Lexington, Chicago, Ill.
Refrigeration Engineering Company, P. O. Box 227, Minneapolis 2, Minn., Pasley Tower, Montgomery, Minn.
Refrigeration Engineering, Inc., 7250 E. Slauson Ave., Los Angeles 22, Calif.
J. C. Rehard, 20000 Joann Conner Highway, Detroit 30, Mich.
Refinery Electric and Engineering Co., 1876 Dundee Rd., Cleveland 12, Ohio.
Remco Co., 340 N. Sacramento Blvd., Chicago 12, Ill.
Republic Steel Corp., Steel and Tubes Div., 2554 E. 151st St., Cleveland 8, Ohio
Research Products Corp., 1015 E. Washington Ave., Madison 10, Wis.
Rockefeller Corporation, 99 Pioneer St., Buffalo 9, N. Y.
Rockwood Co., Tenant Avenue, North Bergen, N. J.
Rockwood Electric Co., 3000 River Road, Blue Grass, Ill.
Rox Engineering & Sales Co., P. O. Box 3541, Oklahoma City 7, Okla.
Rockwell, Inc., 2800 W. Fulton St., Chicago 12, Ill.
Robbins & Myers, Inc., 1345 Lagonda Ave., Springfield, Ohio.
Rochester Manufacturing Co. Inc., Rockwood St. Rochester, N. Y.
Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh, Pa.
Rodwell Inc., 231 Clay St., San Francisco, Calif.
Rooming Manufacturing Co., 1616 Noble St., Sharpsburgh 15, Pa.
Rosin-Connersville Blower, Connersville, Indiana.
Rotary Lift Co., 1254 Kansas, Memphis 2, Tenn.
Rotometals, 988 Harrison St., San Francisco 7, Calif.
Rogers-Kingsmen Mfg. Co., Foster Court, Salem, Mass.
Rupprecht's Rotary Beef Cooler, P. O. Box 6795, Los Angeles 22, Calif.
Rust Engineering Co., 2109 Fifth Ave. N., Birmingham 3, Ala.
The Ruthman Machinery Co., 1899-21 Stanley Road, Cincinnati 2, Ohio

Safety Steel Plates Ring Co., P. O. Box 106, Fort Worth 1, Texas
Saginaw Salt Products Co., 3900 Carrollton Road, Saginaw, Mich.
S & S Welding Machine Co., 670 Lincoln Ave., San Jose, Calif.
Schaefer, Inc., 1101 N. Conway, Evansville 7, Ind.
Schenkel Mfg. Co., 313-22 N. Third St. at Upham, Madison 10, Wis.
Schutte & Koerting Co., Cornwells Heights — Bucks Co., Pa.
Cyrus Shank Company, 4650 W. 12th Place, Chicago 50, Ill.
R. H. Sheppard Co., Inc., 101 Philadelphia St., Hanover, Pa.
The Sherwin-Williams Co., 101 Prospect Ave. N. W., Cleveland 1, Ohio
Silent Hoist and Crane Co., 841 — 65rd St., Brooklyn 20, N. Y.
Silvercup Products, Inc., 141 E. Erie St., Chicago.
Edward Simons, 525 Market St., San Francisco, Calif.
Sisal-Fix Radiator Corp., 87-49 130th St., Richmond Hill 18, N. Y.
James H. Smith, 251 Kearny St., San Francisco, Calif.
Smith, Berbauer & Egan, 20 N. LaSalle St., Chicago, Ill.
Solvay Process Division, Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y.
Southern Advance Bag and Paper Division of Bobpet Sale Company, Inc., 30 Newbury St., Boston 16, Mass.
Sparling Valve Company, 7525 Bowen Ave., St. Louis 17, Mo.
Atlanta 5, Ga., 302 Peters de Lunn, N. E.
Birmingham 9, Ala., 1760-C Valley Ave.
Chicago 43, Ill., 10936 S. Western Ave.
Cincinnati 31, Ohio, 6705 Monastic Dr.
Dallas 29, Tex., 3524 Durango Dr.
Detroit 28, Mich., 6830 West McNichols Rd.
Kansas City 10, Mo., 7210 Virginia St.
Los Angeles, Calif., 317 North Lincoln, Orange, Calif.
New York, N. Y., 22 West First St. Mt. Vernon, N. Y.
Philadelphia 28, Pa., 914 E. Hitchenson St.
St. Louis 17, Mo., 7525 Bowen Ave.
San Francisco, Calif., 1913 Mitchell Way, Redwood City, Calif.
Syracuse, N. Y., P. O. Box 284, Baldwinsville, N. Y.
Spraying Systems Co., 3201 Randolph St., Bellwood, Ill.
Stanbury Tool Corporation, P. O. Box 108, Stanbury, N. Y.
Star-Kimble Motor Div., Kimble Printing Press & Mfg. Co., 200 Bloomfield Ave., Bloomfield, N. J.
Stanbuck Mfg. Co., 3418 Gratiot St., St. Louis 3.
Sterling Lumber & Supply Co., 11900 S. Halsted St., Chicago 28, Ill.
Stewart Products Corporation, 400 North Depot St., Fairfield, Iowa
Superior Valve & Fittings Company, 1509 W. Liberty Ave., Pittsburgh 26, Pa.

Taylor Instrument Companies, 95 Ames St. Rochester 1, N. Y.
Temprite Products Corp., East Maple Road, P. O. Box 72, Birmingham, Mich.
The Texas Co., 135 E. 42nd St., New York 17, N. Y.
Thermal Agency, 1515 Dallas, Houston 2, Texas
Thermoid Company, Trenton, N. J.
Thierstein, Inc., 112 East Sharon Highway, Freeport, N. Y.
Tex-Tor Corporation, 247 Pearl St. N. W., Grand Rapids 2, Mich.
The Trane Company, 206 Cameron Ave., LaCrosse, Wis.
Tranter Manufacturing, Inc., 735 E. Hazel St., Lansing 4, Mich.
Trent Tube Company, East Troy, Wisc.
Tropical Paint Co., 1246 W. 70th St., Cleveland 2, Ohio
Tuferoto Company, Inc., 540 Tuferoto Bldg., East 5th and Locust, Des Moines 9, Iowa
Tuttle & Bailey, Inc., 1760 Corbin Ave., New Britain, Conn.

Unbing Instrument Company, 473 Sixty Avenue, Paterson 3, N. J.
The H. J. Unkauf Company, 3rd & M Sts., N. E., Washington 2, D. C.
Union Carbide Canada Co., 200 W. Cumberland St., Philadelphia 33, Pa.
United States Radiator Corporation, 105 Fourth Ave., New York 3, N. Y.
United States Steel Co., 525 William Penn Place, Pittsburgh 30, Pa.
U. S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.
U. S. Thermo Control Co., 44 S. 12th St., Minneapolis, Minn.

Velocity Power Tool Co., 201 Braddock Ave., Pittsburgh 8, Penna.
The Vilter Manufacturing Co., 2217 S. First St., Milwaukee 7, Wis.
Atlanta, Ga., 207 E. Paces Ferry Rd., N. E.
Chicago 10, Ill., 230 W. Superior St.
Cincinnati 2, Ohio, 6 E. Fourth St. Rm. 504
Minneapolis 2, Minn., 1202 Foshay Tower
New York 17, N. Y., 110 E. 42nd St. Rm. 1407.
Philadelphia, Pa., 20 W. Lancaster Ave. Ardmore, Pa.
St. Louis, Mo., 1116 Fullerton Bldg. 7th & Pine.
Virginia Smelting Co., West Norfolk, Va.
J. H. H. Voss Co., Inc., 785 E. 164th St., New York 54, N. Y.
Henry Vogt Company, 1000 W. Ormsby St., Louisville 10, Ky.
Charleston, W. Va., P. O. Box 1522
Chicago 3, Ill., 111 W. Monroe St. Rm. 1023.
Cincinnati 26, Ohio, 979 Judy Lane.
Cleveland 14, Ohio, 1013 Williamson Bldg.
Dallas, Texas, 1422 Life of America Blvd.
New York 4, N. Y., 80 Broad St., Rm. 3110.
Philadelphia 2, Pa., 1336 Commercial Trust Bldg.
St. Louis 17, Mo., Rm. 300, 6611 Clayton Rd.
San Francisco 8, Calif., 240 Kearny St.

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis.
Walker Laboratories, Inc., 1125 Grove St., Irvington, 11, N. J.
Warren Steam Pump Company, Inc., 11 Bridge Ave., Warren, Pa.
Water Cooling Corporation, 73 Nassau St., New York 38, N. Y.
Water Cooling Equipment Co., 8601 New Hampshire Ave., St. Louis 23, Mo.
Water Treatment Engineers, P. O. Box 2702, Cleveland, Ohio
J. E. Watkins Co., 207 Lake St., Maywood, Ill.
Weston Electrical Instrument Corp., 614 Frelinghuysen Ave., Newark, 5, N. J.
Wheeling Steel Corporation, Wheeling Steel Bldg., Wheeling, W. Va.
The Whitlock Manufacturing Co., 138 South St., Elmwood, West Hartford 10, Conn.
The Wilbur & Williams Co., 130 Lincoln St., Brighton 35, Boston, Mass.
Wilder Mfg. Co., Inc., Mechanic Street and Erie R. R., Port Jervis, N. Y.
Thomas C. Wilson, Inc., 21-11 44th Ave., Long Island City 1, N. Y.
Wingate Manufacturing Co., Dixie Road, Charlotte, No. Carolina
Wolf Condenser Works, 709 Hart St., Brooklyn 21.
Worthington Corp., 401 Worthington Ave., Harrison, N. J.
Atlanta, Ga., 8 Rhodes Center N. W.W.
Boston 16 Mass., 790 Commonwealth Ave.
Buffalo 2, N. Y., 43 Court St.
Chicago 6, Illinois, 400 W. Madison St.
Cincinnati 2, Ohio, 612 Race St.
Cleveland 15, Ohio, 5111 Carnegie Ave.
Dallas 2, Texas, 1826 Life of America Bldg.
Denver 2, Colo., 1640 Blake St.
Detroit 11, Mich., 2224 E. Grand Blvd.
El Paso, Texas, 309 N. Oregon St.
Fort Worth 2, Texas, 716 Tex. & Pac. Term. Warehouse
Houston 2, Texas, 1088 C & I Life Bldg.
Kansas City 6, Mo., 1660 Baltimore Ave.
Los Angeles 58, Calif., 5979 Santa Fe Ave.
Minneapolis 4, Minn., 607 — 13th Ave. South.
New Orleans 7, La., 308 Whitney Bldg.
New York 16, N. Y. 99 Park Ave.
Philadelphia 32, 2900 North Broad St.
Pittsburgh 19, Pa., 2021 Koppers Bldg.
St. Louis 9, Mo., 5060 Lindell Blvd.
Salt Lake City 1, Utah, 116 Social Hall Ave.
San Francisco 7, Calif., 224 Townsend St.
Seattle 1, Wash., 2416 Western Ave.
Washington 5, D. C., 1140 Woodward Bldg.
Wright Chemical Corporation, 625 W. Lake St., Chicago 6, Ill.
Wyandotte Chemicals Corp., P. O. Drawer 111, Wyandotte, Mich.

York Corporation, York, Pa.
Young Radiator Co., 709 Marquette St., Racine, Wisc.

Zeolite Company, 135 S. LaSalle St., Chicago 3, Ill.

Trade Names of Products

REFER TO PAGE 44 FOR COMPLETE ADDRESSES

ABSORBITE—Barnaby-Cheney Co., Columbus, Ohio.
ACI—American Coils Co., Newark, N. J.
ACT—American Coils Co., Newark, N. J.
ADECO—California Steel Products Div. Adeco Industries Inc., Richmond, Calif.
ADVANCE—Southern Advance Paper & Bag Div. Robert Gair Co., Boston, Mass.
AEROFUSE—Tuttle & Bailey Inc., New Britain, Conn.
AEROPASS—Niagara Blower Co. New York, N. Y.
AEROVANE—Tuttle & Bailey Inc., New Britain, Conn.
AIRCLEAR OZONE GENERATORS—General Ozone Corp., Chicago, Ill.
AIR-LEC—Schaellopf Mfg. Co., Madison, Wis.
AIRSERCO—Airserco Mfg. Co., Pittsburgh, Pa.
ALCO—Alco Valve Co., St. Louis, Mo.
ALGOR—Foodwaters Inc., New York, N. Y.
ALL-PURPOSE—Acme Protection Equipment Co., South Haven, Mich.
ALL-WEATHER—Robbins & Myers Inc., Springfield, Ohio
ALODINE—American Chemical Paint Co., Ambler, Pa.
ALPHA 101-102—Alpha Plastics Inc., West Orange N. J.
ALUMALOY—Research Products Corp., Madison, Wis.
AMERCOAT—Amercoat Corp., Southgate, Calif.
AMERICAN—Manning, Maxwell & Moore Inc., Stratford, Conn.
AMERICAN MARSH—American Marsh Pumps Inc., Battle Creek, Mich.
AMERICAN—MICROSEN—Manning, Maxwell & Moore Inc., Stratford, Conn.
AMERPLATE—Amercoat Corp., Southgate, Calif.
AMPCOLD—American Plate Freezer Corp., E. Boston.
ANCO—Anderson Chemical Co., Macon, Ga.
ANDRITE—Ansul Chemical Co., Marinette, Wis.
ANSUL—Ansul Chemical Co., Marinette, Wis.
ANTI-RUST—Foodwaters, Inc., New York, N. Y.
APEX—Uehling Instruments Co., Paterson, N. J.
APRILAIRE—Research Products Corp., Madison, Wis.
AQUACOOLER—The Marley Co., Kansas City, Mo.
ARCTIC—Southern Advance Bag & Paper Div. Robert Gair Co. Inc., Boston, Mass.
ARTIC METHYL CHLORIDE—E. I. du Pont de Nemours & Co., Wilmington, Del.
ARMORTUBE—Bailey Meter Co., Cleveland, Ohio.
ARMSTRONG—Armstrong Machine Works, Three Rivers, Mich.
ASCO—Automatic Switch Co. Orange N. J.
ASHCROFT—Manning, Maxwell & Moore, Inc., Stratford Conn.
ASPIR-JET—Thermal Agency, Houston, Tex.
AUTO-LITE—Electric Auto-Lite Co., Instrument & Gauge Div., Toledo, Ohio.

BAC—Baltimore Aircoil Co., Inc., Baltimore, Md.
BAGAC—Nishonbay Importing Co., Los Angeles, Calif.
BAND-IT—Band-It Company, Denver, Colo.
BANTAM—Samuel S. Gother Co., Chicago, Ill.
BARTY—Mercury Mfg. Co., Chicago, Ill.
BARRELED SUNLIGHT—Barreled Sunlight Paint Co., Providence, R. I.
BARRETT-CRAVENS Co., Northbrook, Ill.
BARRETT BRAND—Nitrogen Div., Allied Chemical & Dye Corp., New York, N. Y.
BARRYMOUNT—Barry Controls Inc., Watertown, Mass.
B&W—Babcock & Wilcox Co., Beaver Falls, Pa.
BETACOL—Foodwaters Inc., New York, N. Y.
BIRD CAGE—Kramer Trenton Co., Trenton, N. J.
BITAN—Garlock Packing Co., Palmyra, N. Y.
BLO-COLD—Acme Industries, Jackson, Mich.
BLUE BIRD—LaCrosse Cooler Co., LaCrosse, Wis.
BOWER BRAND—Henry Bower Chemical Co., Philadelphia, Pa.
BUD BIT—Manning, Maxwell & Moore, Inc., Muskegon, Mich.
BUSH—Bush Mfg. Co., West Hartford, Conn.
BUTCHER BOY—Butcher Boy Refrigerator Door Co., Harvard, Ill.

CALSTEEL—California Steel Products Div. Adeco Industries Inc., Richmond, Calif.
CAPCO—Capco Products Co., Kansas City, Mo.
CARBO-COOLERS—Molsenter Bros., Chicago, Ill.
CARBOLINEUM—Carbolineum Wood Preserving Co., Milwaukee, Wis.
CARRIER—Carrier Corp., Syracuse, N. Y.
CASH-ACME—A. W. Cash Valve Mfg. Corp., Decatur, Ill.
CASH-STANDARD—A. W. Cash Co., Decatur, Ill.
CAT—Caterpillar Tractor Co., Peoria, Ill.
CATCH-ALL—Spartan Valve Co., St. Louis, Mo.
CATERPILLAR—Caterpillar Tractor Co., Peoria, Ill.
CAUSAL—Lunkenheimer Co., Cincinnati, Ohio.
CEMCO—Central States Paper & Bag Co., St. Louis.
CEL-LINE—Dole Refrigerating Co., Chicago, Ill.
CERTIFIED CLIMATE—Parks Cramer Co., Fitchburg, Mass.
CHAMPION LIRS—John H. Matthews & Sons, North Arlington, N. J.
CHEMIC ENAMEL—Barreled Sunlight Paint Co., Providence, R. I.
CHEVRON—Garlock Packing Co., Palmyra, N. Y.
CHILFLO—Industrial Mfg. & Engineering Co., Chicago, Ill.
CHILLATORS—McQuay Inc., Minneapolis, Minn.
CHINALINE—Barreled Sunlight Paint Co., Providence.
CHIP ICE—Chip Ice Corp., Chicago, Ill.
CHROMETS—Dearborn Chemical Co., Chicago, Ill.
CLE-MATIC MOTORS—Cleveland Electric Motor Co., Cleveland, Ohio.
CLERTEMPICE—Bern Refrigeration Co., Chicago, Ill.
CLEVELAND MOTORS—Cleveland Electric Motor Co., Cleveland, Ohio.
COLD-CEL—Dole Refrigerating Co., Chicago, Ill.
COLDJET—Industrial Mfg. & Engineering Co., Chicago, Ill.
COLD STEAM—Walton Laboratories Inc., Irvington, N. J.
CDL-FLAKE—Cal-Flake Corp., Chicago, Ill.
COLDMOBILE—Coldmobile Div. Union Asbestos & Rubber Co. Blue Island, Ill.
COLUMBIA—Columbia Electric Mfg. Co., Cleveland, Ohio.
COMPACUNIT—Warren Steam Pump Co. Inc., Warren, Pa.
COMPAR REFR. HOSE—Resistoflex Corp., Belleville, N. J.
CONDUIT WEATHERMASTER SYSTEM—Carrier Corp., Syracuse, N. Y.
CONSOLIDATED—Manning, Maxwell & Moore Inc., Stratford, Conn.
CONTOUR-WELD—Trent Tube Co., East Troy, Wis.
COOLMASTER—Kramer Trenton Co., Trenton, N. J.
COP-R-LOY—Wheeling Steel Corp., Wheeling, W. Va.
COR-IN—Rotometals, San Francisco, Calif.
CORNING—Corning Glass Works, Corning, N. Y.
COSMOLUB-RIC—E. F. Houghton & Co., Philadelphia.
CROLOY—Babcock & Wilcox Co., Beaver Falls, Pa.
CRYSTALS—Foodwaters Inc., New York, N. Y.
CURVETTE—Kramer Trenton Co., Trenton, N. J.

DACOR—Barnaby-Cheney Co., Columbus, Ohio.
DAMPCORT ENAMELS—Wilbur & Williams Co., Boston, Mass.
DEAN COLD PLATES—Dean Products Inc., Brooklyn.
DEARSOL—Dearborn Chemical Co., Chicago, Ill.
DEMING—The Deming Co., Salem, Ohio.
DEODORITE—Barnaby Cheney Co., Columbus, Ohio
DEOXTDINE—American Chemical Paint Co., Ambler, Pa.
DETROIT—Detroit Hoist & Machine Co., Detroit, Mich.
DIMCO—Detroit Ice Machine Co., Detroit, Mich.
DIMETCOTE—Amercoat Corp., Southgate, Calif.
DOCKER—Automatic Transportation Co., Chicago, Ill.
DOLE—Dole Refrigerating Co., Chicago, Ill.
DOUBLE-FLOW—The Marley Co., Kansas City, Mo.
DOWEX—(Water softening resins) The Dow Chemical Co., Midland, Mich.
DOWFLAKE—(Calcium chloride) The Dow Chemical Co., Midland, Mich.
DOWNINGTOWN—Downingtown Iron Works Inc., Downingtown, Pa.
DRIER—Ansul Chemical Co., Marinette, Wis.
DROMGOLD & GLENN—Coldmobile Div. Union Asbestos & Rubber Co., Blue Island, Ill.
DRY-EX—Acme Industries, Jackson, Mich.
DRY-EYE—Ansul Chemical Co., Marinette, Wis.
DRYOMATIC—Dryomatic Corp., Alexandria, Va.
DUCTATHERM—The Mercoid Corp., Chicago, Ill.
DUOPASS—Niagara Blower Co., New York, N. Y.
DURAFACE FOAMGLAS—Pittsburgh Corning Corp., Pittsburgh, Pa.
DURAMETALLIC—Durametallic Corp., Kalamazoo, Mich.
DURASEAL—Durametallic Corp., Kalamazoo, Mich.
DYNAMOTIVE—Automatic Transportation Co., Chicago, Ill.

EASY-FLO—Handy & Harman, New York, N. Y.
ECLIPSE—Frick Company, Waynesboro, Pa.
E C & M—Electric Controller & Mfg. Co., Cleveland.
EEZION—Pulton Inc., New York, N. Y.
ELECTRO-RIB—Kortland Co. Inc., Long Island City.
ELECTRIMATIC—James P. Marsh Corp., Skokie, Ill.
ELECTROMAX—Leeds & Northrup Co., Philadelphia.
ELECTRUNITE—Republic Steel Corp. Steel & Tubes Div., Cleveland, Ohio.
ELGIN—Elgin Softener Corp., Elgin, Ill.
ENDCOR—Dearborn Chemical Co., Chicago, Ill.
ENGINEERED DESIGN PALLETS—Pallets Inc., Hudson Falls, N. Y.
EPO-LUX—Stoneseto Mfg. Co., St. Louis, Mo.
EVAPOTSOL—Alco Valve Co., St. Louis, Mo.
EXIDE—Exide Industrial Div. Electric Storage Battery Co., Philadelphia, Pa.
E-Z-I Lidner, Sweet, Peel Glass Co., Toledo, Ohio.
EZ KLEEN—Research Products Corp., Madison, Wis.

F&E Automatic Ice Cubers—Flynn & Emrich Co., Baltimore, Md.
FERRENEWO—Lunkenheimer Co., Cincinnati, Ohio
F. E. S.—Freezing Equipment Sales Inc., York, Pa.
FIBERGLAS—Owens-Corning Fiberglas Corp., Toledo.
FILMEEN—Dearborn Chemical Co., Chicago, Ill.
FILTER-DRIER—Spartan Valve Co., St. Louis, Mo.
FIRE-BAR—E. H. O'Neill Floors Co., Cicero, Ill.
FLEXION—Flexonics Corp., Maywood, Ill.
FLO—Allis Mfg. Co., Chicago, Ill.
FLOW-COLD—Acme Industries Inc., Jackson, Mich.
FLOW-MIZER—Acme Industries Inc., Jackson, Mich.
FLOW-TEMP—Acme Industries, Jackson, Mich.
FLOW-THERM—Acme Industries Inc., Jackson, Mich.
FLUX-STIK—Lake Chemicals Co., Chicago, Ill.
FOAMGLAS—Pittsburgh Corning Co., Pittsburgh, Pa.
FOGJET—Spraying Systems Co., Bellwood, Ill.
FORGEWELD—The Coleen Corp., Elyria, Ohio.
FREON—Kinetic Chemicals Div. E. I. du Pont de Nemours & Co., Wilmington, Del.
FRICK—Frick Company, Waynesboro, Pa.
FRIGID-BLAST—Vilter Mfg. Co., Milwaukee, Wis.
FROSTE—Southern Advance Paper & Bag Div., Robert Gair Co. Inc., Boston, Mass.
FROSTLINE—U. S. Gauge Div. American Machine & Metals Inc., Sellersville, Pa.
FULLER—Frozing Equipment Sales Inc., York, Pa.
FULLJET—Spraying Systems Co., Bellwood, Ill.
FULL-VISION—Acme Protection Equipment Co., South Haven, Mich.
FYRE-FREEZ—Walter Kidde & Co. Inc., Belleville, N. J.

GALVICON—Galvicon Corp., Chemical Div. New York.
GAYVAC—Gay Engineering Corp., Los Angeles, Calif.
GEBHARDT'S CONTROLLED REFRIGERATION SYSTEMS—Advanced Engineering Corp., Milwaukee
GEMCO—Geodise E. Moore Inc., Danville, Ill.
GENETRON—General Chemical Div. Allied Chemical & Dye Corp., New York, N. Y.
GENNETT—Gennett & Sons, Richmond, Ind.
GLASFLEECE—The Carney Co., Mankato, Minn.
GLOGARD ENAMELS—Grand Rapids Varnish Corp., Grand Rapids, Mich.
GM DIESELS—Detroit Diesel Engine Div. General Motors Corp., Detroit, Mich.
GO GETTER—Revolvator Co., North Bergen, N. J.
GRANODINE—American Chemical Paint Co., Ambler, Pa.
GRANOLITH—Barreled Sunlight Paint Co., Providence, R. I.
GUARDSMAN PERMAGARD PRIMERS—Grand Rapids Varnish Corp., Grand Rapids, Mich.
GUSHER—Ruthman Machinery Co., Cincinnati, Ohio.
GYROL FLUID DRIVES—American Blower Corp., Detroit, Mich.

HACCO—Hamline Chemical Co., Los Angeles, Calif.
HALLETT—Hallett Mfg. Co., Inglewood, Calif.
HANCOCK—Manning, Maxwell & Moore Inc.
HANDY FLUX—Handy & Harman, New York, N. Y.
HUBBELL—Hubbell Corp., Mundelein, Ill.
HALTS-RUST—Stoneseto Mfg. Co., St. Louis, Mo.
HASKO-BOND—Haskelite Mfg. Corp., Grand Rapids, Mich.
HASKO-MOLD—Haskelite Mfg. Corp., Grand Rapids, Mich.
HASKO-STRUCT—Haskelite Mfg. Corp., Grand Rapids, Mich.
HAVENS—Havens Structural Steel Co., Kansas City.
HEAT-CEL—Dole Refrigerating Co., Chicago, Ill.
HERCULES—Hercules Motors Corp., Canton, Ohio
HEVI-LIFT—Harnischfeger Corp., Milwaukee, Wis.
HI-G CONTROLS—General Controls Co., Glendale, Calif.
HI-PEAK—Acme Industries, Jackson, Mich.
HOMAN-CRANE—Houdaille-Hershey of Indiana Inc., Lebanon, Ind.
HOUDAILLE—Houdaille-Hershey of Indiana Inc., Lebanon, Ind.
HOUGHTO-CLEAN—E. F. Houghton & Co., Philadelphia, Pa.
HOWE—Howe Ice Machine Co., Chicago, Ill.
HYDRAMOTOR VALVES—General Controls Co., Glendale, Calif.
HYDRYER (Dehumidifier) J. F. Pritchard & Co. of California, Kansas City, Mo.
HYSTER—Hyster Co., Portland, Ore.

ICE-A-TERIA—Perfection Ice Scoring Machine Co., Fort Worth, Tex.
ICE-CEL—Dole Refrigerating Co., Chicago, Ill.
ICIZER—The Lilly Co., Memphis, Tenn.
IMECO—Industrial Mfg. & Engineering Co., Chicago, Ill.
IMMERSTHERM—The Mercoid Corp., Chicago, Ill.
INSTRUMOUNT—Bushings Inc., Royal Oak, Mich.
INSULAG (Insulation)—Quigley Co. Inc., New York.
INSULMAT—J. W. Martell Co., Kankakee, Ill.
IPECO—Ice Plant Equipment Co. Inc., Philadelphia, Pa.
ISOFLEX "B"—Isoflex Corp., San Francisco, Calif.
ISOFLEX-K 20—Isoflex Corp., San Francisco, Calif.

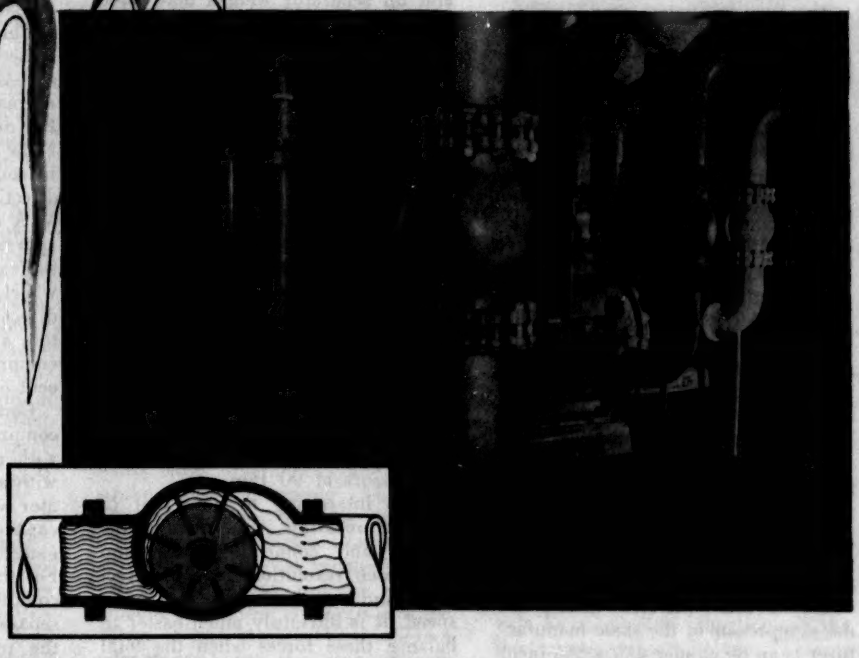
JAMISON—Jamison Cold Storage Door Co., Hagerstown, Md.
J-B-T—J. B. T. Instruments Inc., New Haven, Conn.
JEEP—Mercury Mfg. Co., Chicago, Ill.
JOHN CRANE—Crane Packing Co., Chicago, Ill.
JOINT SEAL NO. 413—Aamite Laboratories, Los Angeles, Calif.

KALKTITE—Prestite Engineering Co., St. Louis, Mo.
KARRY KRANE—Hyster Co., Portland, Ore.
KEN-KAY—Refrigeration Engineering Co., Minneapolis.
KING-CLIP—Lunkenheimer Co., Cincinnati, Ohio.
KING KOLDWALL VESTIBULES—The King Co., Owatonna, Minn.
KING SHARP FREEZE SYSTEMS—The King Co., Owatonna, Minn.
KLOZURE—Garlock Packing Co., Palmyra, N. Y.
KNOWLES—Salt-Ice Corp., Seattle, Wash.

511

Stop in at Booth 511, Dairy Industries Exposition, Oct. 25-30, Atlantic City

THE COLD FACTS for increasing Freezing Capacity AT LOW COST



When your deep freeze output falls behind product demand, you obviously need more refrigerating capacity. To get it, it is not necessary to duplicate your present equipment—or your investment.

The addition of an FES-Fuller rotary booster system on the low side of your present refrigerating compressor will do the trick at a fraction of the cost. By this simple means, you can get up to 50 per cent increased productive capacity for as little as a 10 per cent increase in capital investment—and with no increase in manpower.

The extensive refrigerating engineering experience of FES provides the system design that achieves these results: The Fuller rotary compressor design, with its few moving parts, assures continuation of such performance with only routine maintenance.

If you want increased capacity, without increasing total connected horsepower, flexible loading and long-time low maintenance, while saving on unit power costs, look *first* to the FES-Fuller Booster.

It all boils down to this: Increased refrigeration with a minimum of equipment. It will pay you to ask Freezing Equipment Sales for more detailed information.

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Qualified representatives in principal cities for Fuller Compressors and Low Temperature Freezing Equipment

C-364

Practical Refrigerating Engineer
NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS

Multi-Cylinder Refrigeration Compressors For Single and Multi-Staging

RALPH E. MANNS
R. E. Manns Co., Los Angeles

MULTI-CYLINDER compressors for ammonia as well as "Freon" service are now generally accepted by the operating industry. All major manufacturers now have somewhat similar compressors of this type. Some of the outstanding advantages in this type equipment are:

(a) minimum space and weight requirements,
(b) higher rotating speed,
(c) less costly installation,
(d) unloading devices for easy starting,
(e) capacity control devices for efficient operation,
(f) standardization and interchangeability of parts,
(g) easy maintenance at low cost,
(h) high efficiency, and
(i) packless shaft seals.

Use of more pistons of smaller diameter, shorter stroke, at higher rotating speeds has achieved remarkable space saving as well as weight reduction. For example, a well known make of VSA (vertical single acting) twin cylinder 8½ x 8½ inch ammonia compressor has a rated capacity at 20 psig suction and 185 condensing pressures of 44.6 Tons Refrigeration, requiring 70.3 bhp at 380 rpm. The equivalent multicylinder compressor of the same manufacturer is an 8-cylinder 4½ x 3½-inch, turning at 900 rpm to give 49.6 TR and requiring 79.0 bhp. under the same operating pressures.

The 8½-in. VSA compressor with V-belt drive and motor sheave weighs 5600 lbs., requires 95 sq. ft. of floor space and a minimum of 8 ft. 3 in. height. The 8-cylinder compressor complete with steel base, belt guard and oil separator weighs only 3400 lbs., requires 23 sq.ft. floor space and only 4 ft 2-in. height.

This paper was presented before California Chapter No. 2 Los Angeles, March 16, 1955.

EXECUTIVE OFFICE NAPRE
433 N. Waller Ave.,
Chicago 44, Ill.
OFFICERS
President: Regis Gubser
Los Angeles, Calif.
Secretary, J. R. Kelahan, Chicago 44.

Operating engineers of all refrigerating plants are invited to affiliate with the National Association of Practical Refrigerating Engineers, Inc., an educational association, "not-for-profit".

Compares Piston Speeds

In spite of the higher rotating speeds of multi-cylinder compressors, it is interesting to compare the linear piston travel or "piston speed" of these compressors with their older VSA predecessors.

The 8½ inch compressor at 380 rpm has a piston speed of 522 ft. per minute, while the modern 8-cylinder compressor at 900 rpm has a piston speed of 525 ft. per minute. At a 3-fpm increase, they are slower than the old type open frame compressors of the 1920's which had piston speeds of 540 fpm on the 18½ x 36-inch compressors at 90 rpm, etc.

It is interesting to note that in all reciprocating compressors the pistons and connecting rods stop twice each revolution, reverse direction, and accelerate to maximum speed. It is obviously much easier to balance these forces when the total weight of the piston and connecting rod assembly is only 21 lbs. (as in the 8-cylinder compressor), instead of 113 lbs., the weight of the comparable parts in the 8½-inch compressor.

Multi-cylinder compressors are virtually vibrationless since they are statically and dynamically balanced. This eliminates the need for bulky, heavy flywheels. And, the complete interchangeability of parts brings savings to the machinery owner through quantity production runs with close manufacturing tolerances and weight control by the compressor manufacturer.

First-Cost Figures

Installation of multi-cylinder units is greatly simplified and less costly. No large massive concrete base is required to overcome unbalanced forces. The compressors are usually supplied with steel bases, belt guards (or coupling guards, if direct connected), and usually require no careful leveling and grouting in erection. Controls, oil pressure failure switches, unloaders are usually factory assembled.

Because of their higher rotating speeds, it is usual to use 1800 rpm normal-torque motors for belt drive. For direct connection the compressors allow use of 720-, 900-, 1200-, and in some cases, 1800-rpm motors for direct connected service. The 8½-inch VSA compressor would require 1200 rpm or less for V-belted service, and the expensive engine-mounted or flywheel type synchronous motor for direct connection. Normal-torque motors are approved for multi-cylinder compressors as they all start 50 percent or more unloaded.

Consumer price of the 8-cylinder compressor would be nearly $5200.00 with motor, f.o.b. job site, complete with all accessories such as oil separator with oil return to the crankcase, capacity and unloader controls, gauges, discharge check valve, etc. For the comparable VSA (8½-inch) compressor with motor, standard oil separator, but no capacity controls, the price would be approximately $5784.00

Cylinder Unloading Devices

Multi-cyclinder compressors have unloading devices that hold the suction valves open on at least 50 percent of the cylinders until either oil pressure or discharge pressure has been built up. This so reduces the starting load that normal-torque motors are adequate. As a result, simple, easy, across-the-line starting is achieved without expensive electrical equipment, making possible both lower first cost and power economy.

Unloading devices used for easy starting are generally used in connection with automatic or manual devices to provide capacity control to match fluctuating loads. Most manufacturers do not recommend

continuous operation at less than 1/3 or ½ capacity unless special arrangements are made for cooling the compressor. Such arrangements consist of liquid injection into the suction line, water cooled external oil coolers, or special water jacketing in the compressor itself.

Lubrication Characteristics

It should be pointed out that these modern compressors operate with crankcase oil temperatures considerably higher than the VSA machines. This is apparently due to several reasons. The exterior surface of the crankcase is small in proportion to the refrigeration capacity. Pistons are of the automotive type and are oil cooled, rather than suction gas cooled. The suction and discharge valve assemblies and gas passages are close together so that there may be some superheating of the suction gas. The time interval between compression strokes is less so that piston temperature is considerably higher. The shaft seals are oil cooled in the majority of these compressors.

From experience, it has been learned that crankcase oil temperatures will run about 140 F. under full load conditions with 90 F ambient temperature. One compressor, when operated without on oil cooler, has been checked at 200 F. in normal operation. This is of no particular consequence, if good quality oil of recommended characteristics is used. The compressor manufacturer's specifications for oil should be rigidly adhered to.

While on the subject of oil, it should be emphasized that modern design features the use of efficient oil separators with automatic devices for return of the oil to each compressor. For years, manufacturers, field engineers, and operators have all done everything possible to keep the compressors from using oil. As a result, oil was kept in the crankcase very well, but failed to adequately lubricate the upper piston, cylinder walls, and valves. Now, it is common practice to make the compressor pump some oil, trap out the oil carried over in the discharge, and return it to the compressor.

Parts Interchangeable

An outstanding advantage of these modern high speed compressors is the standardization and interchangeability of parts. Compressors are usually built from two to as many as 16 cylinders, all with identical pistons, connecting rods, cylinders or liners, suction and discharge valves, etc. Thus, the parts, being small and used in large numbers, can be built to precision standards using automatic machines with all the gauges and checking of mass production techniques. This makes for adequate stocks of parts at a minimum cost, with assurance that all parts are interchangeable without hand fitting.

Maintenance is reduced to a minimum. It is now possible for the ordinary operating engineer to completely rebuild a compressor or replace any part without special tools and equipment. No crane, hoist, or additional help are required as all parts are readily accessible and the weight is well within the capacity of any mechanic. The cost of the parts is very reasonable, and the compressor is always rebuilt to the original factory standards.

Inspection is facilitated because of the short period required to open, inspect, and return the machine to service. It is quite common to completely inspect, replace worn parts, and return an 8-cylinder compressor to service in an eight hour period. Contrast this with the seasonal check-up most engineers do on their present equipment. Maintenance work is usually delayed until the winter season because of the long shut-down period. This quite often results in expensive repairs, which would have been minor if taken care of at the first signs of trouble.

Efficiency Features

The low weight reciprocating parts with close tolerances, and short stroke, allows minimum clearances. The design gives large suction and discharge gas passages. Valve areas are extremely liberal because of the valve arrangement and the smaller amount of gas that is moved thru the valves at each stroke. These inherent advantages, plus the ease of controlling capacity, give excellent operating efficiency.

Shaft Seal Improvements

Universal application of some form of mechanical shaft seal operating in an oil bath does away with the major trouble factor in most plants. Gland leakage of refrigerant has been hard to control. Continuous packing adjustment and replacement has been a problem. Rebuilding the shafts where the packing scored has been, in many installations, a regular maintenance procedure.

Refrigerant leaking out has given our NH_3 plants their characteristic odor. Air and moisture leaking in have given us our regular purging and regeneration problems. Mechanical seals give years of trouble free operation as long as the oil is clean, are easily replaced when worn, do not need to be adjusted for varying operating conditions, and allow worry-free automatic operation.

Rotary Type Compressors

In recent years booster compressors of the rotary type have found some use in the refrigeration industry. The most popular among these is the rotary vane-type compressor. The construction of this type consists of a cylindrical casing in which a cylindrical rotor, smaller in diameter than the casing bore, is arranged eccentrically. A number of radial slots cut along the entire length of the rotor hold the sliding vanes. In some units the vanes are made of metal, in others they are non-metallic.

As the rotor revolves the vanes are pushed out by centrifugal force or by springs, forming a number of cells in the space between the rotor surface and casing. Because of the eccentric rotor position, the cells vary in volume from a maximum on the suction side to a minimum on the discharge side thereby imparting a pumping action. These machines are well designed and manufactured. They give excellent service for jobs where they fit and are properly selected. Certain inherent characteristics must be kept in mind, however.

A rotary type compressor must be designed for just one compression ratio. As the rotor turns in its eccentric housing a definite volume of gas is imprisoned between the blades as they move from the suction side to the discharge side. The volume is reduced because of the eccentric slope of the housing. Hence, it will be seen that the volume on the discharge side will be a constant function of the inlet pressure and volume. This is true no matter what the discharge pressure may be.

As an example, assume that one hundred cubic inches of suction gas enters the compressor between two rotor blades. As the rotor turns, this volume is reduced to twenty cubic inches and the gas is compressed. The consequent compression ratio is five-to-one.

The compressor may be operating in a system requiring at the time, a three-to-one compression ratio. However, this makes no difference to the compressor. It must still compress in the five-to-one ratio. Hence the gas after the five-to-one compression must then re-expand to the required three-to-one ratio.

From this, it is obvious that the rotary compressor will function at maximum efficiency at just one com-

pression ratio. If the conditions under which the compressor operates are not the actual design conditions, then the machine is not operating at its full efficiency. It means that the re-expansion of the gas will result in lowered efficiency and higher operating cost.

Entrained Liquid Dangers

Another characteristic of the rotary compressor is its inability to handle heavy liquid slugs on the suction inlet. In normal every day operating conditions, a rotary compressor would not encounter sufficient liquid in the suction to cause excessive slugging. However, there are some plants where this is a problem and it should be considered in installing new compressors.

Suppose, for example, a 100 cfm compressor is designed for an eight to one compression ratio and the entering gas has 15 percent liquid. Then the leaving volume must be 12½ cfm while the liquid already ocupies 15 cfm, which means that there is not sufficient volume in the compressor for the liquid to pass through. This condition would result in a damaged compressor.

Or, with the same eight to one compression ratio, assume that the 100 cfm entering gas contained 10 percent liquid. The leaving volume cfm would be 12½ cfm and with the 10 cfm liquid, the difference or 2½ cfm, would be available for gas. This means that the gas would be compressed from 90 to 2½ cfm or a 45-to-1 compression ratio. This is considerably more than the design ratio and would cause serious trouble.

Seasonal Operations

In addition to these possible difficulties, there are operating problems with rotary compressors. In the event of a seasonal shutdown, these machines should not be shut down and forgotten. They should be turned over for a few minutes operation at least every 10 to 15 days, or the blades will become stuck in the rotor slots. This presents a problem on plants with long shutdowns, particularly those on which the electric rate is partially based on the demand load. The alternate of this occasional starting up, would be to open up the compressor at the beginning of each operating season in order to remove the blades, clean and oil them. This would require an experienced refrigeration mechanic and would possibly take two or three days in order to do a good job.

Another prospect which must be considered is the trouble which can be caused by any dirt or pipe scale entering the compressor through the suction port. Foreign material will undoubtedly and eventually work itself into the rotor slots, and thereby cause them to stick with consequent loss of compression.

This type of machine also has trouble handling ammonia or "Freon" which has water vapor present in the refrigerant. If the refrigerant is not commercially dry, the water vapor present tends to cause the blades to stick in the rotor in the same manner, resulting in a lowered compression ratio.

Fixed Capacity Limitations

Rotary compressors are essentially one capacity machines. There is no means of economically varying the capacity along with the hp required, except by using a multi-speed motor for the drive. When the load is less than the output of the compressor, capacity reduction can be obtained only by intermittent operation rather than by continuous operation at reduced capacity.

Rotary compressors normally require heavier oil than reciprocating compressors for the same compression range, because they are inherently difficult to lubricate. Most rotary compressors have mechanical lubricators that supply metered amounts of oil to various points in the compressor that need lubrication. Circulating systems such as are employed in the conventional enclosed reciprocating compressors are rarely used.

Both the cylinder casing and the heads are oil jacketed on most rotary compressors because they require more external cooling than reciprocating compressors. Separate water cooled heat exchangers and oil circulating pumps are supplied on the larger machines.

It can be seen that rotary boosters, while they will fit in many places, can have extreme disadvantages. If they are to be considered on a job, the existing plant equipment, its operation, and daily and seasonal aspects should be carefully analyzed with the above points in mind. The plant engineer should make the owner fully aware of the limitations of the rotary machine.

News Notes and Chapter Activities

Memphis

CHAS. CONLEY

THE Memphis Chapter entertained more than 150 members, their families and friends at the Chapter's annual watermelon and round-up party, Wednesday, August 17. There were 2,000 pounds of the best watermelons grown available for the feast. E. S. Boland showed a 30-minute sound and color motion picture of Herb Parsons, the crack shot expert. Herb is known throughout the world for his shooting. Now he is training his son in the work.

Texas Costal Bend

VERNON KUMMEL

FIRST speaker at the July 15 meeting was Paul Hewitt of the Geo. B. Allen Company, Houston, Texas, representing the Armstrong Machine Works. His subject was "Non-Condensible Gases and Foul Purgers." The biggest operational problem for any refrigeration system, he said, is non-condensible gases. They cause excessive head pressure, loss of efficiency and increased power costs. A four-psi excess head pressure will give a one percent loss in capacity and added ten percent to the power costs. The method of determining the amount of excessive head pressure is to have accurate pressure gauges and thermometers, and to have a thermometer in the liquid line.

Mr. Hewitt had a cut-away model of an Armstrong purger and its innermost details were clearly visible. The operation of this purger was discussed fully and many questions from the floor were answered. Dan Miller, our instructor, gave his usual enlightening coverage of the low pressure float valve and pressure regulator valves.

We have added three new members to the Chapter this past month: Ken Franke of El Campo, Texas, owner of Franke Ammonia Service; Charles Pheiffer of Central Power & Light Company; and Pete Fatheree of Southern Texas Ice & Service, Inc., Aransas Pass, Texas.

Our contest has one more meeting to go and Team No. 1 is ahead with 575 points, an even 100 points over Team No. 2 which has 475 points. No recesses here.

Los Angeles

FRED HERR

WITH the national membership pennant as the goal, which they hope to nail down as a special tribute to National President Regis Gubser, Frank Muzzy and his Los Angeles chapter membership committeemen worked without let-up during the meetingless summer months to achieve the quota set earlier in the year, "55 more members for 1955". Mr. Muzzy's assistants on the committee are W. R. Burnett, H. C. Carter, Frank Fetcik, Henry W. Hawkins, H. R. Murray, C. C. Nordholm, Gilbert L. Powers, T. L. Rogers and Deleon Stanfield. These are ably backed up in membership planning and execution by President Elmer Johnson, secretary Don Byl and treasurer Emmet T. Quinn, over whose signatures membership drive announcements have gone out several times during the summer.

The committee has gathered a deluxe collection of prizes which will be awarded to those bringing in new members. Con-

fined mainly to the edible field, the prizes include hams, bacon, imported cheese, tuna, fruit cake, and other items in such variety and number that Muzzy promised there would be some kind of a prize for every man who brings in a new member. The more new members, the better the prize, says Muzzy.

Prizes were awarded at the "Go-Getters Night" Ham-and-Beans dinner with which the chapters launches its fall schedule on September 14 in the Terminal Club. Muzzy devised a scoring method that placed members in different classifications, with 14 major prizes as the awards. The classifications are: sweepstakes, single members signing up most new members; amateur class, with 1st, 2nd and 3rd prizes to new members who signed up three more new ones; Old Timers' class, three prizes, awarded to the oldest members signing up new members; salesman's class, with a prize offered to the salesman or factory representative doing the best work in the drive. A classification also was set up for those who are neither old timers nor freshmen. Muzzy has named this the "In-Between-Class" and there were 1st, 2nd and 3rd prizes available. Every member signing up a new member, who did not win one of the 14 class prizes, will get some other kind of prize.

The night of September 14 was also brightened by an entertainment program, arranged by Ed. L. Nelson, chairman of that committee, in order to get the fall program underway in proper style. There is an educational meeting scheduled for Octobers 5, at which a discussion on dry ice and ammonia will be featured; and another on October 19, at which corrosion control in refrigerating plants will be the subject. In November, however, meetings have been cancelled in order to clear the decks for the national convention.

New Orleans

MAX SOFER

OUR August 10th meeting was well attended. The New Orleans Chapter does not suffer from a summer-slump at the educational sessions. Professor Stokes' lectures have a lot to do with the continual interest. When listening to the glowing praise by our educational chairman, Marion Olivier, who introduces our lecturer in his inimitable manner, one feels proud to be associated with an organization which has so much to offer. Compressors were the topic of our discussion at the

Portion of the crowd closing in on the sea food buffet at New Orleans' Chapter outing on Lake Ponchartrain, August. Gerry Vicagas is the husky young engineer on the receiving end of the catering.

Chapter Officers get their turn at chow. Figure at extreme left is the Chapter reporter, Max Sofer; gentleman in checkered shirt so interested in the canned beverage is Past National President Leo Vivien; Chapter President Milt Mancuso and National Director Frank Chase stage the argument with the kitchen utensils.

first August meeting. After a film furnished by the York Corp describing the features of their line of machines, a lively question and answer session followed.

Last week our members were guests of the Reily-Benton Co., dealers in Fiberglas insulation and filters. General Manager Al Lusch, together with Gerry Vicagas, Jim Little and Al Ballanco, invited our Chapter to be their guests at their camp on Lake Pontchartrain. Walter Boden, district manager, Owens-Corning Fiberglas Co., with the help of Walter Mervin of Reily-Benton served a delicious buffet supper to over 100 New Orleans members. Many of our readers will appreciate our delight when I report that the food came from the same L'Enfant's whose food was enjoyed so much at the 1954 National Convention. Of course, some of the boys who had an early start had a hard time doing justice to such an elegant meal after having stuffed themselves with shrimp and crabs which Jimmy Chaisson brought along to start things off. Our Chapter President, Milton Mancuso, has proof that none of the above is exaggerated, having used his camera to good advantage.

Members-at-Large

BERT C. MCKENNA

THREE new members-at-large have been accepted by NAPRE's Board of Directors since last report in September. They are: George B. Johnston in operation and maintenance, Birdseye Division, General Foods, Walla Walla, Washington; Howard A. Wolfberg, project engineer, York Corporation, Minneapolis, Minnesota; and, Max Kreuder, chief engineer, City Products Corp., Savanna, Ill. Welcome, and here are some invitations to get acquainted: Yakima, is some distance from George B. Johnston at Walla Walla, but he would be an honored guest at any meeting; Howard A. Wolfberg should have no trouble affiliating with Twin Cities Chapter; and, Max Kreuder is invited by Chicago Chapter to take in any meeting — 2nd and 4th Tuesdays, Chicago Engineer's Club, Federal Street.

It is expected that many members-at-large living in the Western states will make a point of taking in our National Convention at Los Angeles, Nov. 8-10. Among those in this category, recently "heard from" are Phil Bunnell, Courtland, Calif. It is hoped that Phil's school work can be arranged to permit his attendance.

Ray Griffith of Petaluma, California, took in the last convention at Los Angeles. Hope he is making similar plans this year. Two conventions will bring T. B. Gilliam of San Francisco to the Ambassador and the Biltmore; NAPRE at the former, and NAII at the latter, a week later. The same may apply to C. B. Ferguson at Guadalupe, Calif.

Las Vegas will be represented at Los Angeles, even to the extent of presenting a formal petition for charter. Among the engineers contacted by Tom Russell with regard to a Las Vegas Chapter are: Duane Nordseth, Allen J. Scott and Ralph Parker of the Hotel Sahara. Even over Tucson way, we expect S. L. Cordix to represent his State.

Up in the Pacific Northwest, strong chapter delegations are reported to be shaping up. Our independents, the members-at-large, are out to match them. Recently, Dennis O. Gunnerson, Laramie, Wyoming, sent in his pro-rata dues for '55 (his second year as a member). We hope to see him among the many P.F.E. delegates. Utah would be well represented if some of the following engineers register: Ray E. Judson, Sunset, Robert F. Jones and J. A. Gealta, Ogden, and Warren B. Fox, Hooper.

Idaho is represented on the National Board of Directors by Pocatello's Hubert Branham. Another Pocatello member, among quite a few there whom we hope are on hand, is H. A. Shupe. Dudley Spencer, Idaho Creameries, will probably be very interested in the Dairy speaker. Another newer member (also in his second year) at Walla Walla, Washington, is Charles M. Ayers. Hope he can be at Los Angeles. Earlier this year we learned that Russell R. Ewen of Portland was on the sick list. Lady Luck and good health may be treating him kinder by now, and perhaps his State will be represented once again at our annual meeting.

Foreign members-at-large always seem to be represented at our annual meetings. Perhaps members like Filadelpo Tugade of the Philippines, or Marim Rubenstein of Rq Tassan Engineering, Haifa, will be on hand this year.

Soup on the Rocks

ANOTHER new use for ice has been originated by the Campbell Soup Company. In Life Magazine., August 15, the company introduced "Soup on the Rocks." It says to "take a roomy glass, short or tall, fill it up with ice cubes, pour Campbell's Bouillon on the cubes just as it comes from the can. . . Habit forming? Sure it is. Such a pleasant habit — such a healthy habit — you'll like it before meals, between meals, when you get home from work." Ice men the country over would like to see a wave of drinking iced soup everywhere.

From the President's Desk

NAPRE Executive Sums Up Association Status, Outlines Convention Work, and Cites Texas Chapter Report.

At about this stage in every president's administration he stops to take a hindsight. He wants to see how far he has come and to what extent he has accomplished his particular objectives.

BEING a practical man, I did not set my objectives too high. However, I did have one goal similar to what President Eisenhower had when he started his term. What was that? Why, a balanced budget, of course!

I have not done much better than Mr. Eisenhower. However, we do have one improvement of consequence. Although we have not balanced the budget entirely, we have reduced the deficit between our annual income and expenses.

I believe all members of our Association should have an idea of our expenses and what our sources of income may be. You are entitled to know these facts.

Table 1 expresses the part your dues play in support of your chapter and the national program.

New Finance Program Ahead

Although 97½ cents may appear as a trifle, our deficit is quite large in face of our growing membership and limited reserves. It is imperative that steps be taken to reverse this trend of spending more than we are taking in, but still maintain our membership services.

A committee under the Chairmanship of E. T. Quinn, and consisting of J. Prager and R. Burns was appointed to work with our National Secretary and Treasurer to recommend new financial programs to the delegates at our 46th Convention. If any member has a good sound idea of how we can improve our financial position, Quinn would be pleased to have it before November 1.

For the benefit of members who at times believe the National Office is a little slow in answering their requests, I would like to point out a few facts. Our Association has come close to doubling its membership in the last three years. Now that means our work has more than doubled itself, but our staff is still trying to carry on with the same amount of help as previously.

It is hardly necessary for me to point out that the cost of services and every day expenses have spiraled upward faster than our income. However, your Board of Directors has kept our membership dues low in order that as many operating men as possible will be able to afford membership in NAPRE. That will continue to be our policy.

On The More Positive Side

NAPRE has enjoyed in the past few years a phenominal growth in membership. We have also increased the number of chapters by 10 in the same period of time. This growth will continue at the same pace or even at a greater rate if we keep applying ourselves to the plans offered by our national leaders. There is a high initial cost of setting up each new chapter. These costs more than anything else have caused us to dig into our reserves. As the new chapters gain momentum, their success will mean that the national association will once again be able to restore its modest reserves.

Members may help the Association individually in soliciting new members in the refrigerating industries. Each member you solicit on your own means one less that we will have to solicit by mail. Stationary, stenographic, printing, mailing and postage services all accumulate to some rather large expenses when prospective members are contacted by mail.

Expanded Educational Benefits

During this same period of growth, the Association has expanded its educational benefits. Monthly, the Question Box has answered more questions for the members, and has enjoyed a greater degree of participation by engineers in assisting in the answering of inquiries. You have probably noticed more articles of an educational nature appearing in the journal section of our official organ.

This year the first four sections of the Instructors Manual have been mailed to the chapters in order that the fall meetings may start with the BASIC REFRIGERATION course under this new standardized system of instruction. Four more sections are in the mill, so to speak, and will reach the chapters shortly. This program under the very capable guidance of Dean Harold P. Hayes, our National Educational Chairman and Assistant Chairman Guy R. King, author of the course itself, will enable members to expand their own knowledge and to qualify for a Certificate of Proficiency in refrigerating engineering.

These educational plans are just now gaining momentum. In the coming year we will see more data made available in the form of informative and educational bulletins mailed directly to each member. These bulletins will be in connection with certain chapters of the refrigeration course and are for the purpose of outside or additional reading which will help you improve your knowledge of refrigeration and your performance in your chosen field.

Probably the project in which I can take the most pride as retiring president is the establishment of the Venemann Memorial Educational Fund. Like all worthy projects, this one is off to a slow and steady start. At the coming convention it is expected that the committee will recommend a plan to the delegates for the administration of this fund.

Chapter Report of the Month

It is my pleasure once again to cite the report, which in the opinion of the senior officers of the Association contains information of exceptional merit to all members. The report this month to which I refer is that submitted by the Secretary of the Texas Coastal Bend Chapter, Vernon Kummel. His report appears in this issue.

Regis Enbeer

TABLE I — HOW NAPRE DUES ARE SPENT; AVERAGE INCOME PER MEMBER, ANNUALLY.

Expenses, per Member		$12.47½
Chapter per Capita[1]	$4.00	
Membership[2]	1.00	
Public Relations	.13	
Operating Data Book	2.20	
Educational Program[3]	3.70	
Convention	.87	
National Office Admin.	.57½	
Income, per Member		11.50
Dues	8.00	
Convention Exhibits	.40	
Operating Data Book	3.00	
Misc.	.10	
Deficit[4]		$ 0.97½

[1]Members-at-large also pay $8.00 dues, but the per capita is retained by the National Association to aid in the formation of new chapters.
[2]Includes Contest awards, drives, visits, etc.
[3]Covers INDUSTRIAL REFRIGERATION subscriptions, Question Box Services, Instructor's Manuals for Refrigeration Course, Committee Expenses, etc.
[4]Made up from Cash Reserves

Disneyland Tour Entertainment Highlight of 46th Annual NAPRE Convention

Replica of a famous Mississippi and Missouri Rivers paddle type stern-wheeler, the SS Mark Twain is one of the features of "Adventureland" to be enjoyed by NAPRE wives and children in an all-day visit to Disneyland during the 55 Convention. "Frontierland", pictured, at top right, is another historical reproduction for the education and entertainment of attendants at Los Angeles, Nov. 8-10. Bottom photo depicts Tahitian trading post setting, also a real-life attraction at "Adventureland".

ELMER A. JOHNSON, President
California Chapter No. 2
NAPRE

LATEST of Southern California's feature attractions, Walt Disney's internationally publicized "Disneyland", will be host to ladies and children of NAPRE members and guests in attendance at the Association's 46th Annual Meeting November 8-10. Like Ray Burnett announced last month, and tagged months ago by Larry Benedict as a "Rope Yarn Sunday", all education, engineering, exhibit and business sessions will recess at mid-Convention, Wednesday noon, November 9. Ladies and children will have the entire day off, but the men-folk may join them later at "Disneyland", take in Vern Stubblefield's Golf Tournament, or tour a plant of their own selection.

Members at Los Angeles feel that our Ladies Committee has scored quite an achievement with the "Disneyland" arrangements. Opened only July 18 this year, this attraction has had world wide attention focused on it by the public press, TV, radio and motion pictures. We can think of no newer entertainment, itself an education in American history, folklore, fantasy and adventure, than being able to add this informative social to NAPRE families in attendance.

Main Street, U.S.A.

Described by Walt Disney as the "heart line of America," Main Street, U.S.A. is an exact replica of a small town main street in that happy era from 1890 to 1910. Complete in every detail, from the horse-drawn streetcars which trundle up Main Street to the fire department's turn-of-the-century hose and chemical wagon, "powered" by real fire horses. Visitors see and visit all of the 1900 period business enterprises on Main Street, the photographer's shop, ice cream parlor, bakery, meat market and grocery, bank, music shop, drug store and many others — all operating exactly as they did 50 years ago.

Adventureland

Those romantic, tropical far-away places that all of us yearn to see, await a visitor in Adventureland. A Tahitian trading post provides an exotic threshold for this wonder-world of Nature's own design. Here is a display of tropical flowers, birds, fish and native handicraft gathered from all latitudes. An adventurous cruise in an explorer's boat, over the tropical rivers of the world is a highlight of Adventureland. On this exciting trip, visitors thrill to life-like wild animals, reptiles, birds, monkeys and even native savages. Their boat ventures under a real waterfall as they admire the tropical plants and foliage gathered from all over the world.

Frontierland

Frontierland is America's colorful and historic past. Enter Frontierland through the gates of an old log fort, past leather stockinged frontiersmen and Indians of many tribes, gathered at the entrance. All the stores and buildings, reminiscent of this period, line the board walk of the town. At the blacksmith shop, watch ponies being shod; next door, see the harness maker at work and across the street the ever-famous general store.

National Convention Brass Gathers For Combined Social — Business Session. Pictured left to right are: Director Ray Burnett, Chairman; Asst. Educational Chairman, Guy King; Los Angeles Chapter President Elmer Johnson; National President Regis Gubser; Finance Chairman Emmett Quinn and Larry Benedict, Public Relations. NAPRE ladies on hand, left to right: Mesdames Quinn, Burnett, Johnson, Gubser, King, Paulick and Miss Benedict; Misses Jannet Johnson and Barbara Paulick also posed.

How about "hopping" a freight train? At the Frontierland station, one can board a scaled down version of an old-time (if Etzel, Quinn and Branham, will pardon my mention of a competitor) Santa Fe and Disneyland "iron horse" and ride in the freight car (comfortably provided with special seats) for an exciting ride around the perimeter of the park. Board a buckboard, Conestoga Wagon or Concord Stage to ride by the Marshal's office, the jail, assay office and other frontier enterprises, including an exciting trip through the Painted Desert. The Golden Horseshoe, "longest little bar with the tallest glassful of pop", faces a river dock in Frontierland. Or, take a trip on a 105 foot paddle-wheeler steamboat for a cruise on the rivers of America.

Tomorrowland

Among Tomorrowland's exhibits will be an advance motion picture development, Circarama, consisting of continuous images focused on a 360° screen; the three billion year story of the universe from the time the earth was a flaming globe whirling endlessly through space; and a story on oil production with a 40 foot diorama of the Long Beach area for the setting. See an enormous kaleidoscope of color, a gigantic aluminum telescope; a futuristic conception of American home appliances and installations.

A court of Honor will grace the center of Tomorrowland, flying flags of each state and the American flag. Tape recordings will be used instead of the customary register to identify guests. The Jules Verne Exhibit ("20,000 Leagues Under the Sea") will also be an attraction in Tomorrowland.

Here young drivers-to-be will learn future driving techniques on freeways of the future, and enjoy speedboat excursions through an island dotted waterway. From Tomorrowland the visitor may have an aerial view of America by boarding a space station which, theoretically, travels in an orbit 500 miles above the earth's surface; or you may be a passenger in a TWA Rocket making a round trip to the moon.

Fantasyland

A world of imagination, come to life. Cross a drawbridge to enter Fantasyland through the portals of a medieval castle with towers and parapets rising dizzily above. In Fantasyland, take the Peter Pan ride aboard a pirate galleon that soars over moonlit London to Never Land, home of Mermaids, Buccaneers, Indians and Lost Boys, and flit through the Darling home; take the Snow White ride and meet the Seven Dwarfs, the Wicked Witch, who will offer you a poisoned apple, and all the other characters of this immortal classic. Mr. Toad's Wild Ride runs through a series of misadventures in a 1903 vintage automobile, knocking over a cow and crashing into a barn; you'll travel through the "Pearly Gates" to the sounds of heavenly music. Other gay, novel amusements of Fantasyland are based on cartoon or story book characters that Walt Disney has brought to screen life. Dumbo, the Flying Elephant, a breath-taking aerial ride, the Mad Tea Party, King Arthur Carousel with 72 gorgeous steeds, the Casey Jr. circus train, Canal Boats of America, England, France and fabulous attractions.

This wide range of imaginative reality is in keeping with the Disney scope of activities and is typical of the man himself. When he came to Hollywood in 1923, Walt Disney's assets consisted of $40 in cash and a boundless imagination. He and his brother Roy, a partner in all Walt's ventures, including Disneyland, managed to borrow enough money from an uncle to set up a cartoon studio back of a real estate office. Later, —Much Later,—he was dealing in millions to set up Disneyland, his grandest venture in public entertainment.

Los Angeles civic officials have taken note of NAPRE's plans. The Honorable Don A. Allen, councilman, will represent the Mayor and welcome out-of-city visitors. Prior to his address the entire delegation will hear an invocation by Dr. Wm. D. Johnson, Pastor, First Presbyterian Church of North Hollywood, asking Divine guidance and blessings for the Association's activities.

"Stubby" Stubblefield, golf chairman

Golf Committee Practices-Up

According to Larry Benedict, V. A. Stubblefield, convention golf tournament chairman, made arrangements for a try-out of the convention golf course, The Rancho Country Club, on Sunday July 24 with two of our Los Angeles Chapter members who call it their golfing home grounds. They are, of course, those two inseparable buddies Rudi Kettler and Bill Losch. "Stubby" had as a partner our friend Frank Muzzy.

Naturally Bill and Rudi took the two dubbers to the cleaners for more than beer. Maybe Frank and Stubby will learn not to wager against those two, especially on their own home course where they are personally acquainted with each blade of grass. Regardless of the outcome, Stubby insists that it is an exceptionally beautiful and interesting course, and one that the convention golfers will admire and long remember.

NAPRE

Question Box

The National Educational Committee, NAPRE, answers monthly in this column, operating problems forwarded by members. The Committee appreciates answers from the field. Address questions and answers to Prof. Harold P. Hayes, Dean of Engineering, State Polytechnic College, San Luis Obispo, Calif.

More on Question No. 1064

Asks Inhibitor Suggestions

QUESTION NO. 1064: In January '55, page 41, Question No. 1032, in the final paragraph of an answer on "Bulging Ice Cans" you will see the reference "use an inhibitor to prevent corrosion." We in Australia have tackled this problem of corrosion from many directions, starting with pH control and the employment of various subsequent treatments. But have you a firm recommendation as to the best inhibitor which can be used?—N. K., General Secretary, Ice Mfr's. Assn., New South Wales.

In Answer No. 1, H.P.H. quoted Ca Cl Inst. as recommending 125 lbs. sodium dichromate to each 1000 cu. ft. of calcium chloride brine for a corrosion inhibitor. K.M.H. in Answer No. 2 quotes from the 1954, NAPRE Operating Data Book, from his own article, and recommends ". . . 15 lbs. sodium dichromate . . . per 1000 cu. ft. . . ." It's been a long time since I've seen the professional sales organization and the practical engineer so far apart — or did the publication allow a typographical error? D.K., Oak Park, Ill.

ANSWER: My answer to your additional query can be taken from the 1941 NAPRE Operating Data Book, pp. 19-21. The article contains some typographical errors, but par. 4, col. 1, pg. 20 indicates the basis of my recommendations:

A dosage of 100 ppm plus or minus, as CrO_3, has been found over a period of many years to give good protection. Ten times that much, which you get with dosages given in the ASRE circular, will provide good protection, too. However, it costs 10 times as much for the initial treatment; it takes 10 times as much material for make-up treatments to maintain the established chromate content; and it gives a heavy chromate concentration from which operators are quite likely to develope skin irritations unless they are meticulously clean. Only the more sensitive skins are likely to be affected at all by concentrations of 100 ppm or less.—K. M. Holaday, Anheuser-Busch, Inc.

Prefers Separate Compressor Over Back-Pressure Hook-up

QUESTION No. 1069: Fig. 1, page 16, April 1955, I.R., does not show any suction header on the five compressors, but reading center column, page 15, denotes the gas from desuperheater flows into a header that runs to all compressors. Also the gas from water chiller enters a common header that serves all compressors. Now, this high pressure gas to be handled efficiently should not have to go through a back pressure valve and let down to a lower pressure, but should be handled by a compressor of right size and speed to maintain the desired pressure in water chiller at all times.—M.S.J., Balto., Md.

ANSWER: It is not specifically pointed out in the article, but the back pressure regulator is normally wide open. The purpose of the regulator is just to prevent freeze-up in the chiller and does not normally throttle the gas. When the high-suction pressure is at its normal point, the saturated suction temperature is 34 F. as indicated on page 15. There will be several pounds pressure drop in the line between the water chiller and the compressor, so the evaporating temperature will be at 36 or 37 F. Under these conditions, the back pressure regulator can be wide open and the only penalty is one or two pounds pressure drop through the valve. If the compressor suc-

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tion pressure would be considerably lower than the safe operating pressure for the chiller, I am inclined to agree that another small compressor would provide better economy.—W.F.S., Champaign, Ill.

Seeks Air Volume Per TR For Air & Evaporative Condenser

QUESTION No. 1070: Is there a rule of thumb on the volume of air required through an air-cooled condenser per ton of refrigeration, for normal Midwest Summer Conditions (90-95F, D.B.); also for an evaporative condenser?—P.V.N., Elkhart, Ind.

ANSWER: Our tests at Acme Industries, Inc. indicate that approximately 1000 cfm of (95° F) air is required per ton of refrigeration for an air cooled condenser, based on 40° F suction and 105° Cond. Temp.

Quantity of air (cfm) required for an evaporative condenser will depend upon the design of the coil and the amount of prime surface in the coil. At 78° WB — 105° CT, a coil with 8 sq. ft. of surface per ton requires approximately 60 percent more air than coil having 14 sq. ft. of prime surface per ton. The average designed coil uses approximately 200 to 300 CFM per ton depending on amount of surface per ton and the depth of the coils in rows.—J.T.M., Jackson, Mich.

Gauge Glass Hallucinations?

QUESTION NO. 1071: Our air conditioning consists of coils for chilled water placed in the air ducts near the supply fans. In the engine room is a water chiller in which the water goes through the tubes and the ammonia is around the tubes. At the side of the cooler is a vertical surge tank. The pumps draw water from the surge tank, force it through the cooler, and then upstairs.

Recently I had a bit of trouble with the pump. The motor was O.K. but the pump acted like it was losing its suction all the time. Now here's the payoff! This vertical tank I speak of has two long gage glasses overlapping at the center of the tank. While I was having pump trouble the upper glass was half-full and the lower glass was completely full. So I assumed I had plenty of water there. But I was told the tank was nearly empty. If this is the case, what hold the water in that upper gage glass? I know it was not plugged as I blew it out and the water came back all O.K.

Can that tank be full of air and low water and still hold water in the upper gage glass? As long as the glass is fully open on each end why wouldn't the water drain out even with a tank full of air? We generally keep a small amount of air on top of the water to cushion it. However, the day man says it was about empty and the water was up all O.K. in that upper glass. Have you ever heard of such a happening?—R.G.S., Buffalo, N. Y.

ANSWER: I have discussed your question with several well-qualified engineers and none of them knows of any physical principle which can explain the situation you have described. By all accepted rules, if the tank is empty, the gage glasses should be empty. I suspect that there must be some discrepancy in the circumstances which would explain the apparent unusual phenomenon. Suppose, for example, that the pump suction were impeded in some way as by grit, dirt, or corrosion. This would cause loss of suction by the pump and result in erratic performance. The operator would check the gage glasses first and note that there is plenty of water in the tank. He would then check the pump and observe that it was still operating erratically. He would then check the water level by some means other than the gage glasses. If by coincidence the water had dropped to a low level at this time, the operator would report this fact and we would have approximately the situation you described. Note, however, that the low water level and water in the gage glasses *would not have been observed simultaneously*. If you are certain that the observations were made simultaneously, we may have another flying saucer episode on our hands. —H. P. Hayes, San Luis Obispo, Cal.

Alcohol In Air System An Explosive Hazard?

QUESTION No. 1072: I recently read of an interesting practice in air-operated refrigerator doors. A plant using such doors was experiencing difficulty with moisture freezing in the air lines due to the fact that the lines passed through low temperature rooms. There was repeated freeze-up despite the use of moisture traps and separators in the compressed air system.

The operating engineer developed a means of admitting alcohol to the compressor air intake. Alcohol is thus drawn into the air system to lower the freezing point of the moisture in the system sufficiently to prevent freeze-up in the lines. It seems to me that this might be a dangerous practice. Wouldn't there be risk of an explosion from the alcohol-air mixture?—J.R.K., Chicago.

ANSWER: There should be no particular danger within the compressor itself because the compressor temperature would not reach the ignition temperature of the alcohol-air mixture. Throughout the balance of the system, there should be no danger in normal operation. About the only problem I can see is the usual operating hazard of an open flame in the vicinity of a leak of the combustible mixture. Careless draining of the air-receiver near an open flame could also create a hazardous condition.—H. P. Hayes.

Freezer Floor Repairs

QUESTION NO. 1073—What has been the experience of the members repairing concrete floors in freezer rooms (minus 10 to minus 20 F)? What material was used? Were repairs made while the rooms were in service at these temperatures? Wm. L. P., Jr., Memphis.

ANSWER: Repairing of concrete floors in rooms that have to be kept in service and have temperatures below zero, such as minus 30 F, is more or less of a trial practical operation. If the place to be repaired is not too deep, say 1 to 2 inches, I generally use a mixture of Portland cement, high early or quick set, 1 part cement to 2 parts of sand. I use the brine strengthening chart, Table 8, Pg. 21, Solvay Calcium Company Manual, for determing the amount of calcium to be used in the mix for the temperature of the room. If the place to be repaired is a large

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deep place I use the 1-part cement, 2 parts sand and 4 parts gravel or crushed stone. This is a 3000 lb. concrete, or a 1-2-4 mix.

The calcium chloride people don't recommend more than 4 pounds of calcium to 100 pound bag of cement. I dissolve the calcium in water, wet the cement and sand enough until it is easy to mix, and then add the calcium to the mix. Depending on the size or area of the place in the floor. I enclose the space with a wall up about 2 feet and set the infra-red lamps in the space and adjust the distance of the lamps from the patch as to what effect the heat is having on the patch. It usually works out about 8 to 12 inches

(Continued on page 62)

Present Brine Strength			Desired Brine Strength													
			(A) % $CaCl_2$													
			2.5	7.7	11.5	14.3	16.5	18.3	19.9	21.3	22.5	23.7	24.8	25.8	26.8	27.6	28.2
			(B) Freezing Point —°F.														
Specific Gravity at 60/60°F.	Freezing Point °F.	% $CaCl_2$	30	25	20	15	10	5	0	—5	—10	—15	—20	—25	—30	—35	—40
			(C) Specific Gravity at 60°/60°F.														
			1.022	1.067	1.101	1.128	1.150	1.168	1.185	1.199	1.212	1.225	1.237	1.247	1.258	1.267	1.274
			Pounds of Flake 77-80% Calcium Chloride to be Added per Gallon of Brine														
1.00	32	0	0.28	0.91	1.44	1.87	2.24	2.56	2.86	3.13	3.38	3.64	3.89	4.12	4.37	4.57	4.72
1.10	20.3	11.4	—	—	0.02	0.42	0.76	1.06	1.34	1.60	1.83	2.08	2.31	2.53	2.76	2.95	3.09
1.11	18.7	12.4	—	—	—	0.28	0.62	0.91	1.19	1.45	1.68	1.92	2.16	2.37	2.60	2.79	2.93
1.12	16.5	13.5	—	—	—	0.12	0.46	0.75	1.03	1.28	1.51	1.75	1.98	2.20	2.43	2.61	2.76
1.13	14.5	14.5	—	—	—	—	0.31	0.60	0.88	1.13	1.36	1.60	1.82	2.04	2.26	2.45	2.59
1.14	12.2	15.6	—	—	—	—	0.14	0.43	0.70	0.96	1.18	1.42	1.64	1.86	2.08	2.26	2.40
1.15	9.7	16.6	—	—	—	—	—	0.27	0.54	0.79	1.02	1.25	1.48	1.69	1.91	2.09	2.23
1.16	7.0	17.6	—	—	—	—	—	0.11	0.38	0.63	0.85	1.09	1.31	1.52	1.74	1.92	2.06
1.17	4.1	18.6	—	—	—	—	—	—	0.22	0.46	0.69	0.92	1.14	1.34	1.56	1.74	1.88
1.18	1.2	19.5	—	—	—	—	—	—	0.07	0.31	0.53	0.76	0.98	1.19	1.40	1.58	1.72
1.19	— 2.0	20.6	—	—	—	—	—	—	—	0.12	0.34	0.57	0.78	0.99	1.20	1.38	1.51
1.20	— 5.8	21.5	—	—	—	—	—	—	—	—	0.18	0.41	0.62	0.82	1.04	1.21	1.35
1.21	— 9.4	22.4	—	—	—	—	—	—	—	—	0.02	0.24	0.46	0.66	0.87	1.04	1.18
1.22	—13.2	23.3	—	—	—	—	—	—	—	—	—	0.07	0.29	0.49	0.70	0.87	1.00
1.23	—17.1	24.2	—	—	—	—	—	—	—	—	—	—	0.12	0.31	0.52	0.69	0.82
1.24	—21.5	25.1	—	—	—	—	—	—	—	—	—	—	—	0.14	0.34	0.51	0.64
1.25	—25.8	26.0	—	—	—	—	—	—	—	—	—	—	—	—	0.16	0.33	0.46
1.26	—31.2	27.0	—	—	—	—	—	—	—	—	—	—	—	—	—	0.13	0.25
1.27	—37.1	28.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.09

Note: Lb. flake calcium chloride per gallon × 7.48 = Lb. flake calcium chloride per cubic foot.

Solvay Calcium Chloride Brine Strengthening Chart

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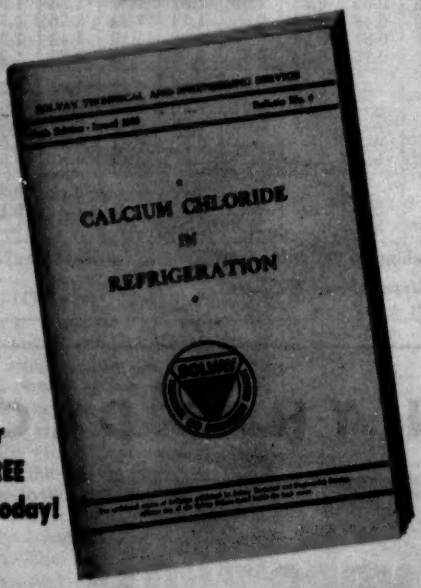

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Year Around Air Conditioning Spreads Out Demand for Power

THE rapid growth of the residential air-conditioning industry has created new problems for the nation's electric utilities which can be solved by increased cooperative efforts between the two industries. A solution to these problems will mean greater service for consumers and more profits for utilities. This challenging statement was made by Geo. S. Jones, Jr., managing director of the Air-Conditioning and Refrigeration Institute.

He called on the electric utilities to give "immediate and careful attention to the problems of increased load if they are to be solved and this greater service to the public is to be fully realized." Reporting on a series of informal discussions he has held in recent months with many utility executives throughout the country, Mr. Jones said:

"My long experience with utility leaders and my contacts with them in recent months on the subject of air-conditioning, convinces me that the average utility executive is fully aware of the situation and is way ahead of us in his planning to take on this additional load."

Before air-conditioning, the peak demand for electricity occurred in the winter. In some parts of the North, this is still true. Where this situation exists, air-conditioning fills in the summer valleys and thus boosts the return on capital investment.

Eliminating Winter Valleys

But, in the South, and increasingly so in the North, the result of the greatly expanding air-conditioning industry has called for the utilization of added generating and distribution facilities which usually remain idle in the winter. And, so, the valleys usually occur in the winter. The utilities are seeking ways of eliminating these winter valleys. The air-conditioning industry is also vitally concerned with spreading out the electric utilities income over a period of 12 months. It feels that such a development will bring greater service to the consumer at minimum rates and encourage the purchase of air-conditioning equipment.

In order to help bring about this "spreading out," the air-conditioning industry is making efforts to demonstrate to the public that air-conditioning equipment is more than a device to cool the home in hot weather. It is pointing out that air-conditioning equipment can be used to dehumidify during damp, but cool, weather; that the equipment can be used to bring fresh air into the home even when it is being heated.

But, the greatest single contribution made by the air-conditioning industry in reaching the objective is the development of the heat pump. This can be in the form of a single room air-conditioner or the larger central-station residential system. The larger central heat pump is, in its truest sense, a year-round air-conditioning unit. It actually reverses its functions, removing heat from the home and dissipating it outside in the summer just as the kitchen refrigerating unit removes heat from the cabinet, and removing heat from the outside air and bringing it into the home (there is always some heat in the air even on the coldest days) in winter.

Commenting on the role of the utilities in this development, Mr. Jones said:

"Much progress has been made in the development of the heat pump with resulting increases in sales. This has contributed toward the solution of the southern utilities' problem of winter valleys created by the expanded use of air-conditioners. The utilities have already played an important role in meeting the increased demand for

power brought on by the air-conditioning industry's developments. Through continued sympathetic discussion of our mutual problems and objectives, our two industries can arrive at the solutions which will bring maximum service to the consumer at minimum rates and increased profits for all of us."

Noise Study of Air Conditioning Installations

A NEW study of noise from air conditioning equipment and installations will be started this fall by the Research Laboratory of the American Society of Heating and Air-Conditioning Engineers.

This announcement was made by Elmer R. Kaiser, ASHAE Director of Research, Cleveland, Ohio, following the endorsement of the plans by the National Association of Fan Manufacturers and the Industrial Unit Heater Association. Both of the endorsing organizations have their headquarters in Detroit, Michigan.

The immediate objective of this project, according to Mr. Kaiser, is the development of a basic method of sound measurement which can be adopted as a standard so that this noise control can be organized on an engineering basis. The need for this sound "yardstick" has been apparent to acoustics experts and air conditioning engineers for several years. Financial support for the program is now being encouraged from individual companies manufacturing fans, blowers, motors, compressors, air conditioner units and other component parts such as ducts, fittings, and grilles.

Measurements of Noise Level

"All measurements of noise level, even by different operators, should be on a comparable basis," said Mr. Kaiser. "Furthermore, the noise level scale should be related to loudness as noted by the human ear. Decibel readings alone are inadequate because they indicate only sound pressure. Loudness is also a function of sound frequency or pitch. A practical measuring technique must combine the sound energies produced at different frequencies. A complication calling for a number of determinations on, say, a fan is the variation in noise emission in different directions."

The Technical Advisory Committee on Sound and Vibration Control of the American Society of Heating and Air-Conditioning Engineers is under the chairmanship of Harold A. Lockhart of Chicago. This Committee has carefully assembled and screened numerous technical suggestions in organizing the program. In addition to the measuring technique, the program seeks to determine the attenuation of sound in ducts, and the regeneration of noise by turbulence in duct fittings and dampers.

Personnel of the Committee is as follows: Chairman H. A. Lockhart, Bell and Gossett Company; Vice Chairman A. F. Hubbard, American Air Filter Company, Inc.; Members: C. M. Ashley, Carrier Corporation; A. E. DeSomma, Navy Department, Bureau of Ships; Sidney Gordon, The Procter & Gamble Company; W. F. Hagen, Chicago Stock Yards Turbo Refrigerating Co.; H. C. Hardy, Armour Research Foundation; E. M. Herrmann, U. S. Naval Engrg. Experiment Station; C. R. Hiers, Joy Manufacturing Company; F. B. Holgate, New York Naval Shipyard; G. C. Kerr, Johns-Manville Sales Corporation; R. D. Madison, Buffalo Forge Company; T. A. Walters, American Blower Corporation.

Copies of the program on Noise in Air Conditioning and details for participation may be obtained from the Director of Research, ASHAE Research Laboratory, 7218 Euclid Avenue, Cleveland 3, Ohio.

True temperature
Always accurate
Years of service
Lasting dependability
Outstanding legibility
Rugged, reliable

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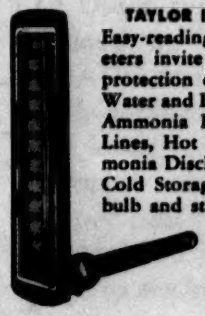
For brine tanks, brine and ammonia lines, bunker rooms, or any process in refrigeration where temperature record is required. Available to record one, two or three different temperatures.



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Easy-reading Taylor Industrial Thermometers invite frequent readings for better protection of your equipment. For Cold Water and Brine Lines, Insulated Brine or Ammonia Lines, Condenser and Water Lines, Hot Water and Steam Lines, Ammonia Discharge Lines, Brine Tanks and Cold Storage Rooms. Wide selection of bulb and stem styles and angles. Ranges: −40° to +950°F. or equivalent Centigrade. Rattle and dust-proof cases. Three-times-easier-to-read BINOC* tubing.

*Reg. U.S. Pat. Off.

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For temperature or pressure applications, where periodic reference only is required. Mercury, gas, organic liquid or vapor actuation, as desired. Variety of ranges. All new movement minimizes linkage error—gives greater accuracy throughout span. Fume and moisture proof case can be face or flush mounted.

Taylor Instruments
MEAN ACCURACY FIRST

(Continued from page 59)

above the patch. The temperature of the room has something to do with it also.

(I have had to reinsulate rooms that were surrounded with other cold rooms, where the temperature of the room being worked on is colder than it should be for back plastering brick and concrete walls. In these cases I have placed infra-red lamps on the wall; a 150-watt lamp for each 2 sq. ft. of surface, not only kept the wall dry, but the lamps would dry the plaster as well.)

The hot asphalt road material is bought from companies here. I don't know what the various mixtures contain. If its a deep hole I get a mixture of small gravel and sand and asphalt, and then top it with a mixture of sand and asphalt. If its a shallow hole I use just the asphalt and sand mixture. Prime the hole with hot asphalt primer. Place the material in the hole, tamp it in good, then smooth off with hot smoothing irons. I use a cold asphalt mixture to repair warm places and rooms that are not too cold. This is a water cut asphalt, using 1½ to 2 parts of asphalt, 1 part Portland cement and 2 parts of sand.—C. A. Conley, Memphis.

New Questions

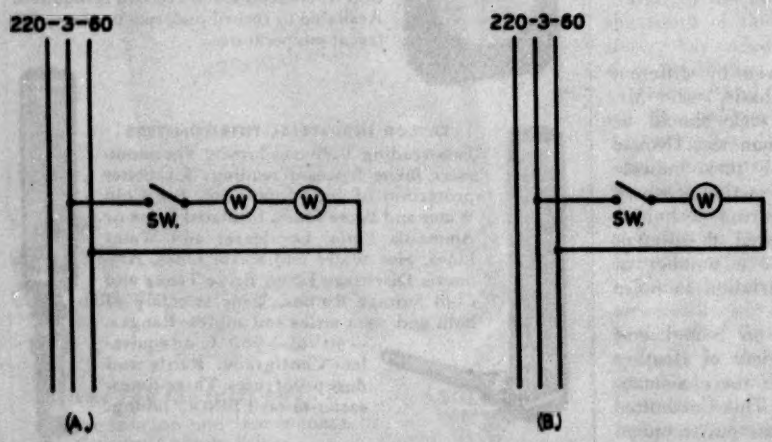
Church Air Cooling Problem

QUESTION NO. 1074: We plan to air cool our church. It will only be turned on during the church services. The church measurements are 40 x 80 ft. with a 16 ft. ceiling. We want to figure for an attendance of 300. The two 80 ft. walls are brick, lathe and plastered. The two 40 ft walls are inside walls to other rooms which are not to be cooled. The ceiling is insulated with 4 inches of insulation. There is a basement under the main floor.

When we built the church, we had the duct work installed overhead. Now all we must do is install the refrigeration machinery. Please be so kind as to inform me, how many tons refrigeration will be required to properly cool this building and what will be the suction pressure. There is approximately 3000 watts of lighting. The blower unit will be located in a room next to the auditorium.—W.H.B., Baltimore, Md.

Challenges Caption With July Electrical Series

QUESTION NO. 1075: Regarding Howard Wolfberg's excellent article in July '55 IR, there is one part which I believe is in error. The caption under Fig. 9 reads as follows: "Comparison of light bulb hook-up with conventional 110-volt bulbs in series (a), and special 220-volt bulb (b). Relays may be wired up similarly." I disagree.—H.B., Chicago.



Comparison of light bulb hook up with conventional 110-volt bulbs in series (a) and special 220 volt bulb (b). Relays may be wired up similarly.

Freezing Pre-Cooked Meals

QUESTION NO. 1076: What is the recommended temperature for blast-freezing pre-cooked meals? What is the recommended cfm per say 100 lbs. of produce to be frozen? Are other methods of freezing pre-cooked meals preferable to blast freezing? What is the lowest temperature that single stage refrigeration using "Freon-22" as refrigerant is recommended? When would you recommend using two stage compression?

The problem in question is the construction of a freezer to freeze approximately 200 lbs. of pre-cooked meals per hour. The meals are on an aluminum tray and it is intended to have the trays on multi-decked trolleys which are wheeled into and out of the freezer room. Storage to be in another room at minus 5 to 0 F. It is assumed that it would take about ½ hour to freeze each batch. Insulation suggested: 10 inches slabcork; ambient temperature, 80 F; water, 75 F.—B. Sachs, Johannesburg.

On Auto Air-Conditioners

QUESTION NO. 1077: I have recently seen a number of publicity releases on automobile air conditioning systems. Do these employ the usual vapor-compression systems? What are their capacities? Can you give me a brief description of a typical installation?—R.A.W., San Luis Obispo, Calif.

Wants Crusher Identity

QUESTION NO. 1078: Where may we obtain parts for our ice crusher? The only identifying tag on the machine is a little label which says "Champion".

DIMCO CAST ALUMINUM FIN EVAPORATING COIL

The Ideal Refrigeration Surface for Cold Storages, Freezer Plants, Dairy Products, Packing Houses, Abattoirs, Breweries and numerous applications

DETROIT ICE MACHINE COMPANY

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★ Saves Space
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★ Saves Cost

CAN BE USED WITH ANY REFRIGERANT

Write For Descriptive Folder

Minute Maid Settles Antitrust Suit

THE Government announced it has settled a civil antitrust suit against Minute Maid Corp. which requires the company to get rid of two of the frozen juice concentrate plants it acquired from the Snow Crop division of Clinton Foods, Inc. Minute Maid also is required to quit operating a third plant it has been running under contract with another firm.

The Government suit, filed and settled on the same day on consent of the Government and the company, bans Minute Maid from acquiring any stock or interest in frozen juice concentrate plants for a period of five years after is sells or disposes of the presently held plants, unless it offers proof to the courts that the new acquisition will not tend to lessen competition or create a monoply in the frozen juice concentrate industry.

However, the Government announcement said, the settlement applies only to the expansion of Minute Maid's business in the frozen juice concentrate industry. It does not relate to the company's acquisition of Snow Crop facilities for producing and selling frozen fruits and vegetables, the Government said.

Acquired in Merger

Minute Maid acquired all the assets of Snow Crop in a merger in November of last year. The Government said its investigation started shortly after that, and negotiations with the company toward the settlement were "almost concurrent" with the investigation. The suit and judgment were filed in Miami.

The suit charged Minute Maid with violating the anti-merger section of the Clayton Antitrust Law. This provision prohibits amalgamations tending to substantially lessen competition or create a monopoly. The Government complaint said Minute Maid's acquisition of Snow Crop's frozen fruit concentrate facilities gave Minute Maid 35 percent of the total industry capacity. It added that the combined 1954 sales of Minute Maid and Snow Crop in the frozen juice concentrate field represented 25 percent of the national market.

Minute Maid, under terms of the settlement, consented to sell or dispose of frozen juice concentrate plants at Dunedin and Frostproof, Fla., which it acquired from Snow Crop. The company also consented, the Government said, to quit operating a plant at Davenport, Fla., which it has operated under a contract with Ridge Citrus Concentrate, Inc. since 1949.

Minute Maid Statement

John M. Fox, president of Minute Maid Corp., said the company will continue to produce and distribute all citrus concentrate products sold under both the Minute Maid and Snow Crop labels.

He asserted: "Our acceptance of the consent decree does not imply any violation of law. Counsel have consistently advised us that the acquisition was permissible and proper in all respects. The settlement was made to avoid lengthy litigation and allay the Government's fears which we believe are completely unjustified."

Minute Maid acquired the Snow Crop plants from Clinton Foods Inc., he said, in order to diversify its product line. He added "the acquisition was for the purposes of permitting Minute Maid, which pioneered the production and distribution of citrus concentrates, to complete more effectively with the larger, longer established companies in the food field. Many of them have integrated lines of products which include frozen foods other than concentrates."

REDUCE REFRIGERATION LOSS . . .

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ELECTRIC COLD STORAGE DOORS

Users report open-door time reduced up to 75% with PREST-O-MATIC doors—resulting in substantial refrigeration savings and maintenance of lower temperatures. Traffic moves through doorways quickly, safely. Open-pass through-close door cycle is completed in 8-10 seconds and more goods are handled in fewer man-hours.

PREST-O-MATIC doors are packaged, complete units, easily installed against opening without loss of floor space. Full width of doorway is usable. Send for complete information or consult your architect.

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Wind Tunnel Built to Study Effect of Ice and Snow Particles on Aircraft Radio

A UNIQUE sub-zero wind tunnel has been used by Stanford Research Institute engineers to find and study a source of aircraft radio interference not previously understood. This mechanism by which precipitation produces radio noise is described in the current issue of the Stanford Research Institute news bulletin, "Research for Industry." As opposed to the widely known corona and "streamering" noise sources which come into play when electric fields about a highly charged aircraft exceed breakdown levels, the most recently found culprit is associated with the effects of individual precipitation particles.

As aircraft speed through precipitation, ice or snow, particles leave a charge at their point of impact on the plane's surface and bounce off with an opposite electrical charge. The many particles set up individual small, but steep-fronted, pulses of current at the antenna terminals. While the effect of each is negligible, many pulses arriving at a random rate produce serious noise which impairs the efficiency of radio communication and navigation equipment.

The experimental study of this phenomena has been undertaken for the Air Force using a 150-gallon vacuum tank fitted with a quick-opening inlet valve at one end. A sample probe, representing the aircraft's surface, is placed within the tank at an angle to the inlet valve and the evacuated tank is placed in a cold chamber.

When the temperature has been lowered to about minus 35 degrees, the chamber is seeded with dry ice and the tank's inlet valve opened for a few seconds to allow ice fog particles to speed into the tank striking the sample probe much as precipitation would strike an aircraft in flight.

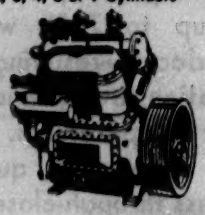
Sensitive instrumentation allowed the research team to isolate and observe the effects of single particles—even though they stream through the entrance orifice at about 15 million per second. The electrical noise produced by this mechanism cannot be eliminated by known techniques but the increased understanding resulting from these studies is expected to aid in the development of methods for alleviating this serious problem.

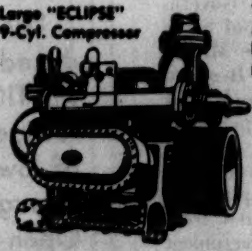
Dentists Use Refrigeration

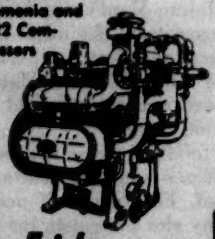
DENTISTS in the future may be freezing the mouths of patients before they fill cavities instead of using a local anaesthetic to kill the pain. Good results with a refrigerating device for this purpose are announced by Dr. Robert J. Eustice of Biloxi, Miss. formerly on the staff of the U. S. Naval Dental School at Bethesda, Md. With the device a stream of air is directed at the mouth tissues. The machine gradually reduces the temperature of the stream from 98 to 33.8 F, thus anaethesizing the tissues.

Of 100 men and women who had the mouth freezing treatment at the Naval Dental School, 94 reported little or no discomfort from having cavities filled. The six others who reported pain had cavities mainly involving the so-called wisdom teeth. Dr. Eustace attributed the discomfort to the relative inaccessibility of these teeth. The new freezing method is expected to be especially helpful to those who cannot tolerate the chemical in the usual local anaesthetic and those who, because of illness, cannot be given local anaesthetics.

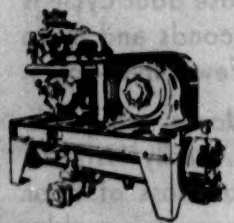
Open-drive Low Pressure Units, ¼ to 15 Hp.


"ECLIPSE" Compressors, 2, 3, 4, 6 or 9 Cylinders


Large "ECLIPSE" 9-Cyl. Compressor


"ECLIPSE" Ammonia and F-22 Compressors

Accessible-Hermetic Units, ¼ thru 7½ Hp.


"ECLIPSE" Low Pressure Units in 5 Sizes

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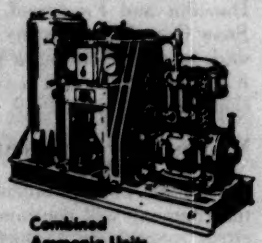
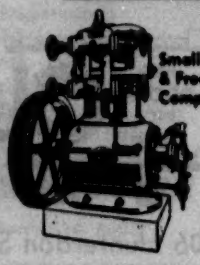
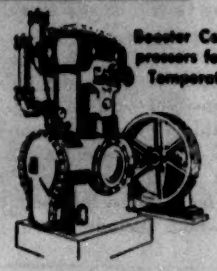
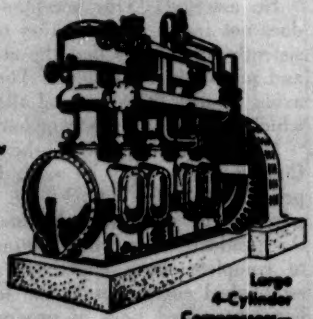

Combined Ammonia Units in 3 Sizes

Large 2-Cyl. Ammonia Compressors


Small Ammonia & Freon-22 Compressors.


Booster Compressors for Low Temperatures


Large 4-Cylinder Compressors—Up to 700 Hp.

Book Review

INDUSTRIAL LUBRICATION PRACTICE, by Paul D. Hobson. Published by The Industrial Press, 93 Worth Street. Illustrated. 548 pages. Price $8.00. For sale by Nickerson & Collins Company, Chicago, Ill.

This book is intended as a guide to sound lubricating practice and its application to cost-saving machine operation and maintenance. Although the primary emphasis is on lubrication, the scope of the book is somewhat wider, including a considerable amount of information about the general operation of various kinds of equipment and the difficulties which may arise from causes other than faulty lubrication.

Its primary emphasis is on practice; on the practical application of sound lubrication theory and methods for the efficient maintenance and operation of a wide range of mechanical equipment and machinery. Enough theory is presented in the early part of the book, however, to provide an adequate basis for the reader's understanding of those technical references necessary in the discussion of techniques and practice which constitute the major part of the work.

An informative survey is provided of the many oils, greases and solid lubricants, both natural and synthetic, that are now available and points out their specific advantages and disadvantages as well as the applications for which each is best suited. The different kinds of plain and anti-friction bearings that are used in present-day machinery are described together with the ways in which they function. The approved methods of supplying lubricants to all types of bearings and the fittings, accessories, and equipment which make it possible to do the job efficiently are covered.

The reader will find much useful information about the deterioration of oil during its use, the decomposition products that are formed and their effects on the machine in which the lubricant is being used.

Kansas Ice Plant Sold

THE Carey Ice & Cold Storage Company, Hutchinson, Kansas, has been sold to a new firm to be known as The Kansas Ice & Cold Storage Company. John Bear, Wichita, will head the new firm. Mr. Bear is engaged in the ice and cold storage business with plants in Wichita and Oklahoma City. The transaction took place August 31.

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FOR STRUCTURALLY SOUND LOW TEMPERATURE INSULATION

United's patented BB (block baked) Corkboard installs easier and stays on the job! High strength in relation to light weight permits a sturdy, self supporting structure that is simple to erect. United's corkboard is flexible; the big straight-edged slabs fit accurately and work as easily as lumber. Most important, there is adequate flexibility to conform to minor wall irregularities and absorb stresses. *You get a tight fit that stays tight . . .* that prevents creation of moisture-carrying channels which can eventually destroy the insulation value of your installation.

Yes, United BB Corkboard gives you truly time-tested insulation with a unique combination of benefits ideal for low temperature service.

- All cork construction without added fillers or binders.
- Extremely efficient heat insulator that retains initial low K factor when properly installed.
- No capillary attraction for moisture, hence doesn't rot, swell, warp or support bacterial growth.
- Fire retardant; insect, vermin resistant.
- Bonds tightly with cement, paint, hot or cold asphalt.

COMPLETE INSTALLATION SERVICE TOO!

Your nearby United Cork Companies branch office provides a *complete* corkboard service . . . *from product to final installation* . . . to meet your individual needs. Trained engineers are available for consultation . . . or will design every detail of your job. If you desire, our skilled work crews, supervised by the same engineers, will erect your installation. Almost half a century of service to the refrigeration industry assures the satisfactory performance of *your* BB Corkboard installation . . . today and for years to come.

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Engineering and installation offices, or approved distributors, in key cities — coast to coast.

RSP Cherries Records Near Record Pack

BIG production of red sour pitted cherries in the U.S. this year has resulted in the second largest pack of frozen cherries on record, according to the National Association of Frozen Food Packers. A total pack of 111,323,800 pounds of RSP cherries is being marketed, nearly 25 million pounds more than last year.

All of the gain in production was accounted for in the northeast and midwest areas as the only other important producing area, the far west, showed a slight decline from 1954. The northeast, principally New York and Pennsylvania, shot up nearly 37 percent above last year. In the midwestern states of Michigan, Wisconsin, and Ohio production was up 30 percent.

As in previous years, the bulk of the 1955 pack, 103,317,465 pounds, went into 30-pound tins for commercial and institutional uses, and most of this will wind up being sold over bakery counters as cherry pie. Less than 4 million pounds were put up in retail sizes. Only in 1953, when 115,241,575 pounds of RSP cherries were packed, has production surpassed the current year.

Cold-Col **TRUCK PLATES** . . . Engineered to maintain any temperature required throughout the trip. With 4-3-2 connections . . . Send for engineering catalog CE.

Ice-Col **ACCUMULATORS** . . . For air conditioning of churches, cafeterias, halls, offices, and other buildings having heavy loads of short duration . . . Also used for sweet water cooling . . . Send for engineering catalog BE.

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Heat-Col **AUTOMATIC DEFROST** . . . Latest development in low temperature refrigeration. Faster heat transfer for quicker defrosting. Performs in any ambient . . . Send for engineering catalog DE.

QUICK-FREEZE STAND . . . For quick freezing foods. Also used for storing frozen foods in small walk-in refrigerators with low ceiling . . . Send for engineering catalog AE.

QUICK-FREEZE PLATE . . . For quick freezing foods. Also used assembled in banks immersed in water as an ice accumulator, or for cooling liquids . . . Send for engineering catalog AE.

OVERHEAD PLATE . . . For low or high temperature rooms—ceiling or wall mounting . . . Send for engineering catalog AE.

OVERHEAD BANK . . . Featuring natural convection. Minimum dehydration loss . . . Send for engineering catalog AE.

DOLE REFRIGERATING COMPANY

Tax Write-Offs For Flood Damaged Plants

THE Office of Defense Mobilization has announced that defense related plants, including refrigerated warehouses and other plants in the refrigerating industry, will be immediately eligible for necessity certificates covering fast amortization of the cost of rebuilding facilities damaged by the recent east coast floods. Application should be made to one of the Department of Commerce field offices in the disaster area, and must include ODM form 164 certifying that the assistance will be used to put back into operation plants affected by the floods.

Necessity Certificates For Warehouses

AS OF August 27, 71 necessity certificates had been issued for refrigerated warehouse construction since the beginning of the tax amortization program in 1950. In reply to NARW's inquiry, the Interstate Commerce Commission said these certificates represented an investment of $35,120,345 and approximately 30,646,000 cubic feet of refrigerated space. This works out to an average cost of $1.15 per cubic foot, excluding the cost of land. The issuance of these certificates points up the essentiality of refrigerated warehousing to the defense program and the fact that government officials in the defense agencies are aware of this service.

NARW Receives Award For Safety Program

THE National Association of Refrigerated Warehouses has been awarded a Certificate of Recognition by the American Trade Association Executives in recognition of its successful industry safety program, according to A. R. Carstensen, chairman of NARW's Safety Committee.

In making the award, which resulted from the annual ATAE Awards for Distinguished Service Contest, ATAE cited NARW, and its safety program, for a meritorious contribution to the advancement of Trade Association management . . . one of "exceptional value to its members and its industry."

Mr. Carstensen pointed out that in two years of safety campaigning, the public refrigerated warehouse industry's Frequency Rate (number of reportable injuries per million man hours worked) had dropped 23½ percent and its Severity Rate (total time charges per thousand hours worked) had dropped 44 percent.

Oyster Processing Research

UNDER the contract provisions of the Saltonstall-Kennedy Act, which became fully active last February, several projects are now under way on Atlantic and Gulf Oysters. One of these, under Dr. E. A. Fieger at Louisiana State University at Baton Rouge, is also a TRRF project. Quality tests now being used on shrimp will be carried out on oysters, and bacteriological studies will be conducted on oysters at various stages from shucking to freezing and thawing.

Coordinated studies have been initiated at Florida State University in Tallahassee and Tulane in New Orleans. In addition to chemical and physical studies, such products as frozen blanched, frozen smoked, and frozen scalloped oysters will be investigated. Control of drip will be a major objective. General direction of the contract studies will be handled by U.S. Fishery Technological Laboratory at College Park, Md. This work is directly integrated with the studies of Pacific oysters at the U.S. and Wild Life Laboratory in Seattle, Washington. —TRRF Bulletin

COMING CONVENTIONS

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
October 14-15, 1955
Peabody Hotel, Memphis, Tenn.
KENNETH E. TROMBLEY, Director.

FLORIDA ICE ASSOCIATION
October 9-11, 1955
Daytona Plaza Hotel, Daytona Beach, Fla.
MURIEL WASHBURN, Secretary

CANADIAN ASSOCIATION OF ICE INDUSTRIES
October 17-19, 1955
Guildwood Inn, Point Edward, Sarnia, Ont.
MILDRED E. CROFT, Exec.-Secy.

NATIONAL ASSOCIATION PRACTICAL REFRIGERATING ENGINEERS
November 8-10, 1955
Ambassador Hotel, Los Angeles, Calif.
J. RICHARD KELAHAN, Secretary

NATIONAL ASSOCIATION OF ICE INDUSTRIES
November 15-18, 1955
Biltmore Hotel, Los Angeles, Calif.
GUY W. JACOBS, Exec-Secy.

AIR CONDITIONING and REFRIGERATION EXPOSITION
November 28-December 1, 1955
Convention Hall, Atlantic City, N. J.
GEORGE MILLS, Show Director

DELTA STATES ICE ASSOCIATION
December 4-6, 1955
Buena Vita Hotel, Biloxi, Miss.
MRS. EDNA VAUGHAN, Secretary

SOUTHWESTERN ICE MANUFACTURERS ASSOCIATION
December 11-13, 1955
Gunter Hotel, San Antonio, Texas
P. A. WEATHERRED, Secretary-Counsel

AMERICAN SOCIETY OF REFRIGERATING ENGINEERS
December 1-3, 1955
Traymore Hotel, Atlantic City, N. J.
R. C. CROSS, Executive Secretary

MISSOURI VALLEY ICE MANUFACTURERS ASSN.
January 9-10, 1956
President Hotel, Kansas City, Mo.
V. A. ESPHORST, Secy-Treas.

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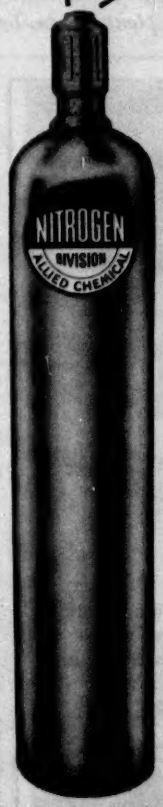
REALLY PURE

REALLY DRY

it's

BARRETT® BRAND

Anhydrous Ammonia



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—high speed delivery! Cylinder stocks maintained at all our coast-to-coast distributing stations. There is one near you ready to fill your needs promptly and regularly. 150-, 100- and 50-lb. cylinders. If you use *large* quantities, ask about our tank truck delivery service—*you'll save money.*

Outstanding purity —no free non-condensable gases to cut down efficiency, or other impurities to corrode equipment.

Exceptionally low moisture content
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☐ Please have your specially trained Ammonia Technical Serviceman call, discuss the economical use, etc. of Anhydrous Ammonia. No obligation.

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Cleanest Engine Room Used in Safety Demonstration

CLAIMED to be the cleanest ice plant engine room in the country, that of the Geyser Ice Plant at Waco, Texas, is pictured below. The signs were used in a safety demonstration by W. F. Leonard, Jr., director of safety for the Southland Corp., parent company of Geyser Ice.

Engine Room of Geyser Ice plant, Waco, Texas.

Shown in the picture are: Coy Argo, manager of the Waco plant; George Thompson, chief engineer; two operating engineers; and Mr. Leonard. Mr. Leonard took for the theme of his talk the idea that "Safety is Everybody's Business, 24 Hours a Day."

British Golfers Get "Four"

TWO golfers halted on a suburban golf course, London, England, when they saw a group of children on the fairway. "Fore!" they chorused to get the youngsters out of the way. The next thing they saw was an ice cream seller scurrying across the links from a nearby road holding four ice cream cones in his hand. "Your order, gentlemen," he said.

Hotweather Note

AN Indiana man was reported attending a party when they ran out of ice. He offered to replenish the supply. Going to a place with an automatic dispenser, he deposited some coins in the device and put the bag it ejected back into the trunk of his car. When he arrived back at the party they opened the bag and found he had bought a sack of coal.

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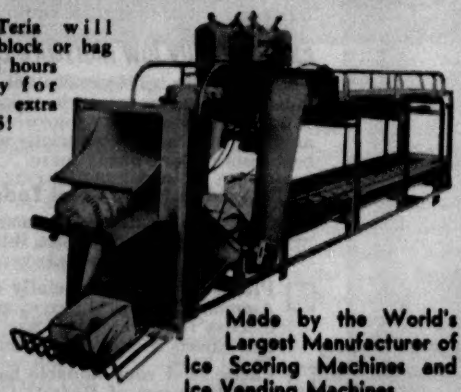
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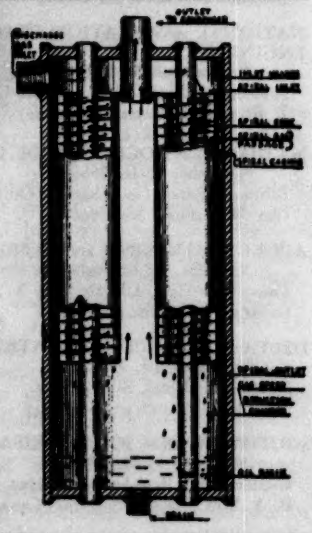
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Brass Industry Seeks To Avoid Shortage

THREE of the most powerful groups in the trouble-ridden brass industry joined in petitioning the President of the United States to invoke his emergency powers to stave off "the worst crisis in the industry's history." Underscoring their plight with statistics from a nation-wide survey, the groups wired an appeal to President Eisenhower to meet with them personally to consider a program which would provide relief from the shortage situation. The telegram was signed by Herbert Barchoff, president of the Copper and Brass Warehouse Association, for that group, the Copper and Brass Research Association, representing the leading mills of the country, and the Wire and Cable Section of the National Electrical Manufacturer's Association.

The survey revealed that brass and copper inventories have been depleted "almost to the vanishing point," according to Barchoff. Distributors and warehouses across the country reported an average of one to three weeks' supply on hand. The survey, sponsored by the Copper and Brass Warehouse Association, also disclosed that some 30,000 small manufacturing plants, employing about 850,000 workers, would have to shut down by the end of September unless the delivery of brass and copper mill products returned to a near-normal level.

Harassed by strikes and shutdowns earlier this summer which drastically reduced inventories, the industry was dealt a further blow, and its severest, by the recent floods which swept through the Connecticut Valley, cutting production sharply at that brass mill center.

Normalcy could be restored, the President was informed, by the release of 100,000 tons of stockpiled Chilean copper, either through the use of his executive power, or legislation which could modify present Office of Defense Mobilization regulations. The three orginzations urged the calling of a special session of Congress, if necessary, to pass the required laws.

The U. S. Government had bought the Chilean copper, they recalled, to aid Chile's ailing economy. "We urgently request, for the sake of our American economy," their telegram stated, "that this 100,000 tons of stockpiled copper be released to industry." Release of the copper, they pointed out, would also help eliminate the dangers of inflation and profiteering to which the industry is now exposed, "threatening the entire national economy." "The price of copper has spiraled fantastically," they warned, "rising from the World War II OPA ceiling of 12 cents per pound to 30 cents per pound in April, 1955, to a present minimum price of 43 cents, with commodity brokers reporting up to 53 cents." Government action, it was urged, is imperative to restore normalcy.

Cooling Load Estimate Form

THE Cooling Load Estimate Form for Self-Contained air-conditioners published by the Air-Conditioning and Refrigeration Institute is available in pads or tablets, according to an announcement by the Institute.

The forms, previously published only as part of the ARI Standards for Self-Contained Air-Conditioners, are being made available in this way to accommodate those who use the form repeatedly to calculate the cooling load in stores, restaurants and other places where self-contained air-conditioners are commonly used.

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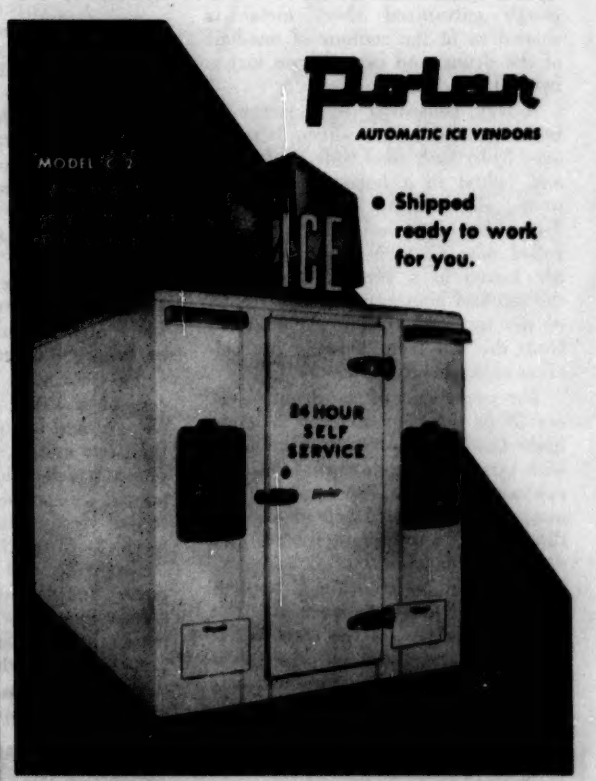

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Simplified Shop-Made Humidifier Controls Humidity in Eastern Warehouse

HIGH humidities in cooler rooms of cold storage warehouses can be a problem to operators, but W. Warren Wilson, vice president of Camden Refrigerating and Terminals Co., Camden, N. J., has simplified the problem with a shop made unit.

They are one of the oldest refrigerating firms on the East coast and one of the largest in the nation. They have been using calcium chloride brine at this plant since it opened in 1928, and have used flake calcium chloride as a dehumidifying agent for over 30 years.

Mr. Wilson, an NAPRE member, is also general superintendent and chief engineer, and with a natural engineering curiosity, he began several years ago to develop what is today a very simple dehumidifier.

How to Make One

It consists of a standard size 50 gallon drum from which the lower end is removed, and which is supported in a horizontal position by a ¾ inch pipe frame. A section of 24 gauge galvanized sheet metal is shaped to fit the contour of one-half of the drum, and extends two inches beyond the drum length.

A tray, consisting of 16 gauge ⅛ inch mesh galvanized screen, is rolled over 3/16 inch steel rods at the end and bolted in a horizontal position to the sides of the 24 gauge metal. Two additional sections of screen, rolled over ⅛ inch bent steel, rods, are bolted in a vertical position to the top and bottom of the lower ends of the tray, to prevent air currents from the fan from blowing the calcium chloride off the tray.

The upper end of the drum is cut out to fit the ring of a 16 inch exhaust fan which is bolted to the drum with three 5/16 inch stove bolts. The exhaust fan has a 1725 r.p.m. ¼ HP motor rotating a 16 inch aluminum, three wing, 24 degree pitch blade and delivers 2560 c.f.m.

Flake calcium chloride is applied in a ½ inch uniform layer over the entire top surface of the tray. When the calcium chloride absorbs moisture, the solution drips down and runs out the lower end into a bucket.

Two of these simple dehumidifying units operate satisfactorily in a room of about 60,000 cubic feet. Usually they are loaded with calcium chloride only once a day, sometimes once every other day. The fans may run 24 hours per day, for weeks at a time.

The simplified dehumidifier in a room where cheese is stored for future shipment. Note the slight slope of drum, so solution runs into bucket. Right, W. W. Wilson, originator, indicates fan at rear of unit.

At temperatures from 32 to 36 F., the relative humidity is controlled between 70 and 75 percent. During the storage of more critical goods the humidity has been held at 55 percent for a long time.

Dehumidification No Problem

Mr. Wilson advises dehumidification has been no problem with them. They have a number of portable dehumidifying units. Plans for building the unit are not available but he states that one can be made easily in any maintenance shop, at a total cost of about $30 excluding the fan.

The company makes good use of calcium chloride in their sprinkler system; it protects the entire storage space of their building although it is of fireproof construction.

They estimate that it takes in excess of a 1,000 HP to operate machinery and equipment to refrigerate their two million cubic feet of storage space, which holds up to 25 million pounds of perishable food, at controlled temperatures ranging from minus 10 F. to 70 F.

Receiving and shipping platforms on the first floor can accommodate 11 refrigerator cars and 30 highway trucks at one time. Large modern high speed freight elevators connect these platforms with refrigerated rooms on the upper eight floors.

The Mixing Tank

Calcium chloride brine is the refrigerating medium. Their 3,000 gallon capacity brine mixing tank is of concrete and steel construction and has been in service since 1928. The brine solution is prepared at the rate of 4.12 pounds of calcium chloride for each gallon of water in the solution, and specific gravity is held at 1.265.

Once the brine has been mixed it is delivered to a 12,000 gallon capacity refrigerating system within the warehouse, and a roof tank — part of the fire protection system — stores 30,000 gallons of brine. The brine is circulated by means of centrifugal pumps.

Horace W. Wilson is president of Camden Refrigerating and Terminals Co. He is also president of Quaker City Cold Storage Co., an organization dating back to the turn of the century. He is nationally known in the refrigeration industry and is past president of the Natl. Assn. of Refrigerated Warehouses, American Warehousemen's Assn., Eastern States Ice Assn. and the Pennsylvania Warehousemen's Assn.

Reprinted by permission from Calcium Chloride Institute News.

Washed Eggs on Way Out

WASHINGTON Cooperative Farmers Association, Seattle, one of the country's largest egg marketing cooperatives, has followed poultry producers of central California and other groups in a refusal to accept new or renew old agreements with producers who wash eggs, according to a note in the Refrigeration Research Foundation Bulletin. There have been no results from efforts to find a satisfactory method of washing eggs. Hence, the decision to follow the "contra-washing" direction, which seems to be the one that results in real progress.

Mexican Food Team Tours United States

During August and September, a team of thirteen members, representing the Mexican government, labor and industry in the fruit and vegetable preservation field, made a five-week study visit to the United States to gain background information on American methods of food preservation.

The purpose of this project was to give Mexican industry precise and thorough knowledge of up-to-date techniques, especially in the phases of farm-to-market, farm-to-cold storage, and farm-to-cannery and freezer. Large wastage of perishable and semi-perishable fruit and produce is caused by lack of suitable handling. It is believed that with canning, cold storage, dehydration and quick freezing plants strategically located in the principal growing areas, and with proper handling, substantial economies would result, thereby raising the standards of living of the working population. Of special interest to this team was the transportation of fruit and produce and cold storage operations, especially of citrus fruits and root vegetables.

Upon return of the group to Mexico, they will prepare a comprehensive report which will be given wide distribution. The team members will also work closely with U. S. experts who will go to Mexico and who will organize with the team members a well integrated plan for the solution of the marketing and distribution of fruits and vegetables in Mexico.

Project Manager for the U. S. International Cooperation Administration, Training Division, was Edward Gilman, Jr. Societies in the United States cooperating with the governments of Mexico and the United States were National Canners Association, Dr. Ira I. Somers, Assoc. Director; Pacific States Cold Storage Warehousemen's Association, Jack L. Dawson, Sec'y.; Western Conference of Cannery Workers, Peter Andrade, Director; Market Service Association, Virgil J. Pickell, Gen'l Mgr., NAPRE, J. Richard Kelahan, Sec'y; and, American Council on Education, Dr. Harry Wann, Director.

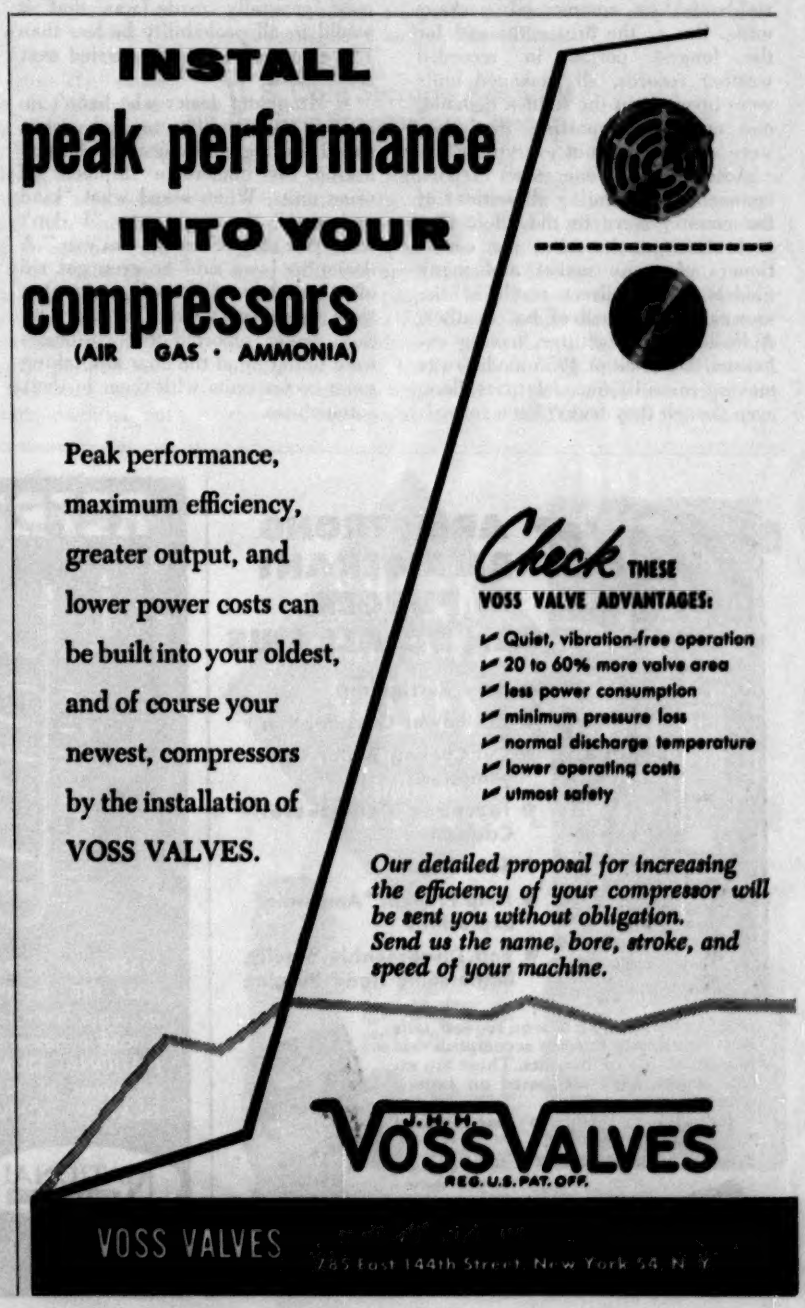
Firms visited by the Mexican team were Exchange Orange Products, Ontario, Hunt Foods, Inc., Fullerton, Fernando Canning Co., San Fernando, Filice & Perrelli Canning Co., Inc., Richmond & Merced, all in California. In Oregon, plant inspections were made at Paulus Bros. Packing Co. and Blue Lake Packers, Inc., Salem.

Chicago installations visited were Fruit Auction Sales, Produce Terminal Co., Continental Freezers of Illinois, Inc., and Central Cold Storage Co. Seabrook Farms, Inc., Bridgeton, N. J. and John H. Dulany & Son, Inc., Fruitland, Md., were on the Eastern itinerary. The team also visited the University of California Agriculture Campus at Davis, and California State Department of Health at Berkeley.

U. S. Department of Agriculture stations included in the tour were: Western Utilization Research Branch, Albany, California; Agricultural Marketing Service, Chicago and Washington, D. C., and Terminal Inspection, N.Y.C.

Marketing Expert at Florida Convention

ONE of the highlights of the Florida Ice Convention to be held October 9-11 in Daytona Beach will be an address by Dr. Frank Goodwin. Dr. Goodwin some years ago took part in a short course co-sponsored by the Association and his selection was made as a result of popular demand by the members.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Heat Wave Boosts Air Conditioning Sales

THE record shattering heat wave which spread over the country during the middle and latter part of July apparently provided an impetus for record sales figures for all classes of packaged air conditioning, according to dealers.

When the first hot spell covered all sections of the country, the general opinion of sales executives was that it would lead to record sales of room air conditioners, but that it would not greatly boost the larger residential or commercial package units. But as the heat continued for the longest period in recorded weather records, all packaged units were involved in the sudden demand, one executive reporting that they were scarce on about everything.

According to one news report, comments representing all sections of the country were to the effect that real shortages in room air conditioners of many makes and many models was a direct result of the unusually long spell of hot weather. A leading manufacturer, having exhausted his stock of 1955 models was moving some 1956 models to retailers, even though they hadn't been formally introduced to the trade. In residential systems, there apparently was an unusual call for additional cooling units to be installed in homes. The big public want, it seemed was to get cooling into the home as fast as possible.

Among commercial installations, hotels and motels were among the most active buyers. The public, according to one dealer, seemed to be demanding, with some mental heat, air conditioning in any kind of establishment that catered to individuals.

On the question of inventory carryover likely into 1956, the comment most generally made was that it would in all probability be less than 25 percent of what was carried over from 1954.

A Minnesota dealer who hadn't installed air conditioning for years, called the regional office in Chicago, asking for immediate shipment of some units. When asked what "kind and size," the reply was "I don't care, just ship whatever you can." A dealer in Iowa said he even got rid of a number of console units that were three years old. One big Chicago dealer reported that customers were lining up at the door and taking room cooler units with them in their automobiles.

In Detroit and other cities, electric power output climbed to record peaks when people began putting air conditioning units and fans into high gear, it was reported. In Cleveland, sales of room air conditioners were reported to be eight times the total for the same month of last year.

One manufacturer said they feel that residential air conditioning offers the greatest challenge and the greatest future the industry has had in the last twenty years. The heat pump, it was stated, may enter as a major factor. And looking into the distant future, on the drawing boards there are expanded-air systems and electronic systems which both heat and cool.

Florida Warehouse Expands

THE Board of Directors of the Florida Cold Storage Warehouse, Tampa, Fla., has authorized an immediate expansion of the cold storage facilities. The present plant has a capacity of 2,500,000 pounds, and the proposed addition will increase the total capacity to more than 4,000,000 pounds, according to a statement by Nelson Mason, president.

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Refrigeration Developments to be Shown At Air Conditioning Exposition

MANY members of the refrigeration industry will be interested in developments to be shown at the Air Conditioning & Refrigeration Exposition in November, according to F. G. Coggin, of Detroit Controls Co., Detroit, Mich. Mr. Coggin is chairman of the exposition committee of the Air Conditioning & Refrigeration Institute, sponsor of the show, which will be held at the Atlantic City, N. J. Auditorium, November 28 to December 1.

"Industrial development has progressed so fast that control of temperature and humidity is one of the most important elements in both maintenance of quality and reduction of production costs," Mr. Coggin declared. "Very few industrial plants can afford the luxury today of spoilage, corrosion and production delays caused by improper temperatures and humidity. High speed machines make very exacting demands from the atmospheres in which they operate, and it is only plain common sense that workers who are being paid constantly mounting wages should be permitted to work at top efficiency by conditioning the air in plants."

The exposition will break all records for size when it opens in November. It will be more than one-third larger than the last show. Exhibiting companies now total 232, with an expected 250 at the time of the opening. Displays will cover 88,000 square feet of net exhibit space.

"Factories are not alone in their recognition of the need for air conditioning," Mr. Coggin pointed out. "Retailers also have discovered that the small investment in air conditioning is an absolute essential not only for greater sales during the hot months, but also for lowered costs in maintaining inventories all year round and more efficient use of store and warehouse space.

"Refrigeration is, of course, just as important in all these areas. Refrigeration is fast becoming almost as important as heat in some metal working processes. In a dozen other industries, it has been found that refrigeration is one of the most effective cost reduction methods available to engineers," Mr. Coggin said.

"As for refrigeration in food sales, the American housewife has proven conclusively that she will buy more and more frozen foods in almost exact proportion to the amount which is displayed to her in refrigerated cabinets. The bottleneck in frozen foods sales is principally at the retail level and when the food retailer makes adequate provision for displaying frozen foods, sales and profits will soar."

U. S. Cold Storage Acquires Poultry Processing Concern

THE United States Cold Storage Corp., plans to acquire the Edward Aaron Corp., Kansas City, through an exchange of stock, E. M. Dodds, chairman, announced. Edward Aaron processes and sells poultry and frozen eggs. Sales are approximately $10 million a year.

Terms of the proposal call for issuance of 16,000 additional shares of U. S. Cold Storage common in exchange for assets of Edward Aaron Corp. To provide for the additional stock, U. S. Cold Storage holders will have a special meeting September 9, to approve increasing authorized common stock from 120,000 to 200,000 shares.

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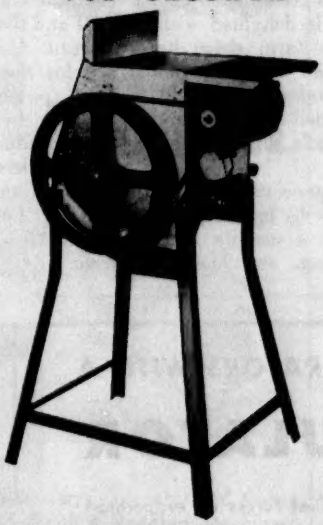
Four grate adjustments give crushed ice from "pea-size" to 1½" chunks, by merely turning grate handle on side of hopper.
Galvanized for prevention of rust.
All-steel shell, legs and grate handle.
Belt driven, no gears, and self-aligning ball bearings.
Chute for filling containers.
Safety-shelf for block ice to be placed before entering crusher.
Guard covers flywheel, belt and motor pulley.
Only $125.00 with 1/3 HP motor.

Bateman 25 CROWN ICE CRUSHER



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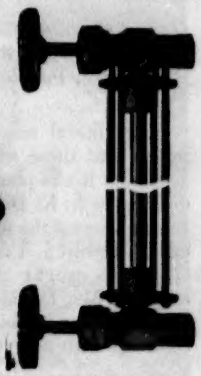

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Snowmen Help to Sell Overcoats in July

LAST summer the Liberty Fuel & Ice Company, Portland, Oregon sold Weiner's Clothing Store in downtown Portland on the idea of piling snow ice on the sidewalk in front of the store (in July) as publicity for the store's annual overcoat sale. It proved such a valuable advertising stunt that this year a similar use was made of snow ice; six snow men were posted on the sidewalk in front of the store and again the display helped to sell overcoats.

One of the snow men advertising the overcoat sale for Weiner's Clothing Store, Portland, Oregon

Some literal minded readers may notice that these snow men have no arms, but it was planned that way, according to L. K. Davidson of Liberty Ice, to prevent the arms being broken off by children. Even without arms, the stunt caught the public fancy, but now Mr. Davidson is wondering about what new idea he's going to come up with next year.

Refrigerated Warehouses Receive Safety Awards

THIRTEEN refrigerated warehouses have been awarded Safety Certificates for outstanding plant safety records by the National Association of Refrigerated Warehouses. The plants qualified by going one year or more without a lost-time industrial accident.

The five plants receiving two-year awards are: Beall Refrigerating Co., Santa Barbara, Calif.; Germantown Cold Storage Co., Inc., Germantown, N.Y.; Holly Cold Storage Co., Oakland, Calif.; The Lancaster Ice Manufacturing Co., Lancaster, Pa.; and The Mowery Cold Storage, Mechanicsburg, Pa.

The eight plants receiving one-year awards are: Alabama State Docks Board (Cold Storage Department), Mobile, Ala.; Crosby Cold Storage Co., Inc., Olean, N. Y.; Davis Frozen Foods, Inc., Lexington, N. C.; Haddon Ice & Coal Co., Haddonfield, N. J.; The Little Rock Cold Storage Co., Little Rock, Ark.; Port Everglades Refrigerating Co., Fort Lauderdale, Fla.; Santa Clara Cold Storage and Freezer Co., Santa Clara, Calif.; and York Cold Storage Co., York, Nebr.

Kansas Farmer Rides An Air Conditioned Tractor

A KANSAS farmer, Leslie Yager, who spends an estimated 800 hours each summer on his farm tractor, built his own air conditioned cab two years ago and is delighted with it. Working in his farm shop, he made the cab from scrap angle-iron and sheet metal from an old water tank. He added rear fenders and mounted the whole works on the tractor.

He then bought some used refrigeration equipment, a ½ hp compressor and condenser, a cooling coil, valves, copper tubing, and blower. These went into a refrigerator air conditioner for the cab.

Plans were worked out by Kenneth H. Harkness of the Kansas State College department of agricultural engineering. The condenser coil is mounted in front of the radiator where inflowing air pulls off heat taken from the cab interior. The cooling coil is located above the cab windshield with a blower forcing air through it. Air is filtered as well as refrigerated.

On a hot day temperatures are 20 degrees lower inside the cab than outside. The last touch of comfort came with the installation of tinted glare-free windows around the cab. The cost of the entire cab and equipment was about $500.

Room Air Conditioner Standards

A COMPLETELY revised edition of the ARI Standard for Room Air-Conditioners has been published, according to an announcement from the Air-Conditioning and Refrigeration Institute. The new Standard, which is designated as ARI Standard 110-55, was prepared by the Institute's Room Air-Conditioner Engineering Committee.

The section of Rating Requirements which ties in manufacturing tolerances with published capacity and other ratings is the key provision in the 16-point program for advertising and selling room air-conditioners developed recently by ARI and the National Better Business Bureau. Also included in the Standard for the first time are the minimum power factor values recommended by ARI and the electric utility industry.

Pamphlets including the new Standard and the ARI recommended Cooling Load Estimate Form for Room Air-Conditioners are available from ARI.

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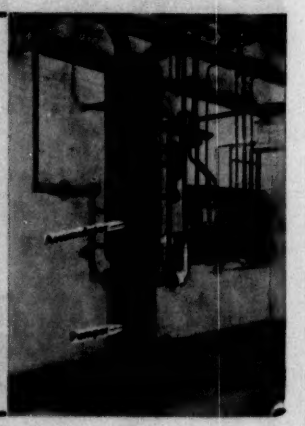


Modern Plant Speeds Processing Frozen Foods

(Continued from page 13)

six high-speed multi-cylinder compressors, capable of combinations and hookups for freezing 200,000 pounds of foodstuffs daily. At present, plans are being considered to double this capacity. Provisions were made at the time of the original installation for space requirements and piping hookups needed for additional evaporative condensers, heat exchange vessels and compressors.

At Sunnyvale a large research program is also in operation. Variety on the crops that are to be packaged for freezing are checked. Also much research on how to improve frozen food products both in fruits and vegetables is carried on at Sunnyvale, the research headquarters of Libby's California Fruits Division.

New Crusher Speeds Up Icing Sweet Corn

ICING of sweet corn in wet-strength paper bags has been speeded up by a new farm ice crusher which automatically measures the ice and loads it into the bags. The crusher was developed by Franklin P. Miller & Son, East Orange, New Jersey in field tests with the New Jersey Agricultural Experiment Station and New Jersey corn growers.

The crusher is mounted on wheels for easy movement from one location to another. It is available with either electric or gasoline engine. The unit was designed to meeet the needs of the small farmer. Up to six bags a minute can be iced with it. The amount of ice per bag is adjustable and the crusher may be set to produce any size of ice desired from fine to coarse. The crusher is also suitable for use in packaging and icing other crops, such as cabbage, spinach and radishes.

Peoples Gas Building Cooled With Gas-Fired Boilers

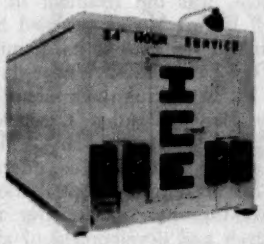
THE 20 floors and basement of the Peoples Gas office building at 122 South Michigan avenue, Chicago, is being air conditioned with gas heat, at a cost of about two million dollars. The basement which now houses the customer auditorium, and six floors are now being cooled, with the necessary construction in progress on four additional floors. By the end of 1956, a spokesman for the utility company estimated, the entire building will be refrigerated.

In the sub-basement are three gas-fired boilers, each rated at 375 horsepower. These generate steam to operate a turbine. The turbine in turn drives a centrifugal compressor, cooling the water used in the building's air conditioning system.

Aside from the use of gas heat for cooling, the system has several unique features. The pipes carrying the chilled water run to every alternate floor. The air ducts for cooling however are on every floor, with blower fans to push the chilled air over the pipes in all the walls.

Consolidated Enters Frozen Foods Field

THE Consolidated Foods Corporation, has completed negotiations to acquire American Frigid Dough Inc., Chicago processors of frozen bakery products and prepared frozen foods. The announcement was made by S. M. Kennedy, Consolidated Foods president, and Marvin R. Polkow, president of American Frigid Dough.



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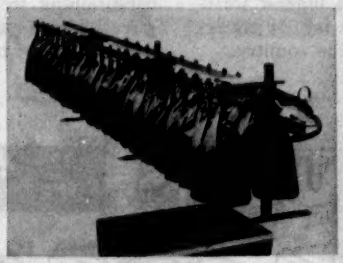

9 x 10 ft. Vending Station

Mark II. Complete with Blower/Evaporator and Automatic Hot Gas Defrost. With 4 Vending Machines. Tremendous Capacity 10 or 12 lb. bags. Less than $4,000 delivered East Coast.

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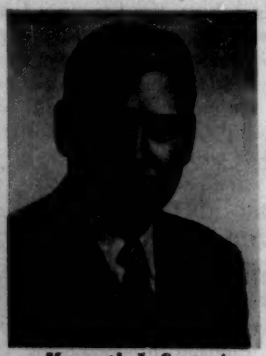
National Ice & Cold Storage Appointments

THE appointment of Kenneth J. Sartori, formerly superintendent of ice departments, to the position of superintendent, ice and cold storage divisions of National Ice and Cold Storage Company of California is announced by M. W. Young, vice-president and general manager. Mr. Sartori is in his sixth year with the



Kenneth J. Sartori

National organization and in his twenty-first year in the ice and cold storage business, having managed ice and cold storage properties formerly operated by Grace Bros., in Northern California.

Other promotions announced by the company are: George A. Portello, since 1941 branch manager of the company's two plants in San Francisco, to the new position of cold storage sales manager, San Francisco Division; Robert L. McManus, since 1942 warehouse superintendent at the company's cold storage plant at Battery and Union Streets, San Francisco, to branch manager of the same plant; Arthur M. Stoker, since 1928 manager of city ice delivery of San Francisco and more recently manager of the San Francisco Ice Delivery Division of National Ice, to the position of branch manager of the ice manufacturing, delivery and cold storage plant at Kansas and Division Streets, San Francisco; and Asa S. Briggs, assistant warehouse superintendent, to warehouse superintendent at the Battery and Union Street branch in San Francisco.

Refrigeration Men Attend International Congress

FOR the first time, the Refrigeration Research Foundation was represented at a meeting of the International Congress of Refrigeration at Paris, August 31 to September 16. The Director, H. C. Diehl, represented TRRF. He was also an official delegate of American Society of Refrigeration Engineers, and observer for the American Institute of Refrigeration. Others who attended the Congress included Carl Kayan, Columbia University; W. T. Pentzer, U. S. Department of Agriculture, George Stewart, University of California; W. H. Cook, National Research Council of Canada; W. B. Cowan, Winnipeg, Canada; R. C. Jordan, University of Minnesota; E. F. Jansen, U. S. Department of Agriculture.

Friend New Manager Seaboard Terminal

THE appointment of Kenneth N. Friend as vice-president and general manger of the Seaboard Terminal and Refrigeration Co. of Jersey City, N. J., has been announced by William J. Sinek, president of the City Products Corp. Seaboard is one of City Products Corporation's nation wide network of 18 refrigerated warehouses, which form the country's largest cold storage chain. It is City Products Corporation's biggest warehouse, and one of the largest refrigerated warehouses in the country.

Mr. Friend comes to City Products Corp. from the National Ice and Cold Storage Company of California. He has worked in all phases of cold storage operations since entering the field in 1929. During World War II he served as naval officer with the Cold Storage Division, Naval Supply Center, Oakland, Calif. He later became officer in charge of the Cold Storage Division, Naval Supply Center, Pearl Harbor.

News of People

PHILIP G. KUEHN, Wisconsin Cold Storage Company, Milwaukee, has been named chairman of the Wisconsin Republican Volunteer Committee. Having resigned his former position as Chairman of the Milwaukee Country GOP organization, Mr. Kuehn assumes this new job, as the youngest Republican ever to hold the State Chairmanship.

CHARLES S. LEOPOLD, consulting engineer of Philadelphia, whose research and development contributions to the field of air conditioning are in evidence in some of the nation's most imposing structures, was honored by the Franklin Institute. Mr. Leopold who has been a Consulting Engineer since 1923, was the recipient of a Frank P. Brown Medal awarded by The Franklin Institute at its Annual Medal Day ceremonies, Wednesday, October 19. In making the announcement, Dr. Henry B. Allen, Executive Vice President, noted that Mr. Leopold is being cited "In consideration of his outstanding contribution to air conditioning, particularly in the research and development of air conditioning techniques and the application of air conditioning to a wide variety of important structures."

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50-lb. cubes of heavily compressed salt.

Dissolve evenly. Keep brine at constant Salometer strength.

Eliminate labor, guesswork, measuring, waste.

Uniform! Clean! Reduce icing of coils. Prevent clogged nozzles.

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MANUFACTURERS' NEWS

"Freon" Refrigerants Will Observe 25th Anniversary

NEARLY 25 years have passed since the first sale of "Freon" fluorinated hydrocarbon refrigerants. January 1956 will mark the quarter century mark since Dr. Thomas Midgley, Jr., Dr. Albert L. Henne and associates announced their discovery of "Freon" and a new era opened up in the application of refrigeration, especially in food processing, comfort and industrial air conditioning and numerous other manufacturing processes.

From "Freon-12" the family has expanded to 21 members, the five most familiar being "F-11", "F-12", "F-22", "F-113" and "F-114". "Freon 13" and "Freon 14" are being used in low temperature test work. The use of Aeroseles in which Freon propellents are used have skyrocketted in every direction and account for a large usage of the refrigerant.

Some of the "Freon" compounds are good fire extinguishers and have been introduced recently into fire-fighting equipment for the Army and Air Force. Several passenger airlines are converting their fire extinguisher systems to use "Freon".

The demand for "Freon" has brought about an expansion in manufacturing plants from one at Carneys Point, N. J. in 1931 to four in the United States and one in Canada today. A few years ago the East Chicago, Indiana, plant was opened to serve the Midwest. The Louisville, Ky., plant is completed and by fall of 1956 the Antioch, Calif., works will begin operations.

Armstrong New Head Sales Industrial Insulation

TO PROVIDE specialized service on industrial insulating materials, the Armstrong Cork Company has created a new management function called manager, industrial insulation sales. F. S. Donnelly, formerly manager of the company's insulation division's Pittsburgh office, has been appointed to the new position. Assisting Mr. Donnelly in the new function will be J. P. Sawyer who will also continue to serve as manager of insulating refractories sales.

Continuing as manager of contract operations will be J. W. Liddell. S. C. Martin will be assistant manager of contract operations as well as manager of

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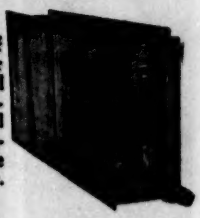

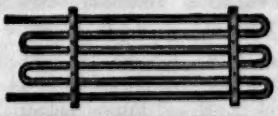

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THE King CO. OF OWATONNA
986 N. CEDAR ST. OWATONNA, MINNESOTA

low temperature insulation sales. R. H. Stark, now building products division district manager at Seattle, will succeed Mr. Donnelly as district manager for the insulation division at Pittsburgh.

Owens-Corning Announces Personnel Changes

TWO personnel changes in Industrial Insulation Products group of the Industrial Construction Materials Division at Owens-Corning Fiberglas Corp. have been announced by Hugh T. Williams, sales manager.

W. J. Lemaster

W. H. Weisman

William H. Wiseman was transferred from the Philadelphia Branch to become manager of Power and Process Industrial Insulation Sales. Mr. Wiseman, a graduate of the University of Pittsburgh, joined Owens-Corning in 1951 as a sales trainee and was assigned to the Philadelphia sales staff in 1952. He will devote major attention to Kaylo and Fiberglas sales in the power, processing, refining and chemical industrial fields.

W. J. Lemasters, formerly administrative assistant to Mr. Williams is now manager of Commercial and Light Industrial Insulation Sales. Mr. Lemasters joined Owens-Corning in 1946 at the Newark plant and held positions in production and purchasing before being transferred to Toledo in 1953 to become administrative assistant in the Industrial Construction Materials Division. He will concentrate his efforts in the plumbing, heating and ventilating market on pipe and duct insulations. He is a graduate of Kent State University and a veteran of four years in the Navy.

Worthington Buys New Plant, Expands Facilities

A MANUFACTURING plant at Ampere, N. J. has been acquired by The Worthington Corp., Harrison, N. J., where the company will center its air conditioning and refrigeration division. Hobart C. Ramsey, chairman, in a special report to stockholders noted the new manufacturing property and office space brings the number of Worthington plants to 29, of which 17 are in the United States and 12 in foreign countries. The new unit is located four miles from Worthington's general offices.

CATALOGS AND BULLETINS

Report on Ice Rinks

"ICE SKATING Rinks — Their Construction and Maintenance" is the title of an illustrated, 32-page special report published by the Engineering Service Department of A. M. Byers Company, Pittsburgh, Pa. Prepared for architects, engineers, arena superintendents, rink owners and municipal officials, the new brochure contains a brief foreword, a conclusion and eight major sections listed under individual subject headings.

Sections include discussions of corrosion and corrosion control, types of rink construction, comparative service record data, case history digests of rink installations in varied sections of the country, recommended maintenance procedures, brine tables and a listing of helpful technical bulletins published by A. M. Byers Company.

The Report contains more than 40 illustrations. These include a service-life chart of ice floor piping in 25 rinks, photomicrographs of wrought iron and steel, a presentation of the structural difference between wrought iron and steel, a view of one section of wrought iron pipe after fifty-three years of service, photographs of rinks and rink piping, and illustrations depicting construction details of two types of ice rink floors: 1, The open or sand filled floor and 2, The closed or permanent floor.

Booklet on Oil Filters

ENGINE life depends in a large measure on effective oil filters to keep harmful abrasives away from vital parts. In "Filter Research, How and Why. . .," a new booklet published recently by Caterpillar Tractor Co., the story behind the development of effective oil filters is told.

This eight-page booklet starts at the Caterpillar test stands, carrying through testing in engines in the laboratory and the field to the final design resulting from conclusions. Copies of this booklet, from DE583, may be obtained from any Caterpillar dealer or by writing Caterpillar Tractor Co., Peoria, Ill.

Booklet on Insulation

A NEW 8-page catalog, "Foamglas, the Cellular Stay-dry Insulation for Piping and Equipment", has been published by the Pittsburgh Corning Corporation. The new booklet presents the physical properties of the unique cellular glass insulation; sizes and shapes available; and suggested thicknesses required for temperatures ranging from Minus 50 to 800 F. Condensed recommended specifications and photographs of applications make the booklet a reference for engineers, applicators and insulation contractors.

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Carnation Enters Frozen Food Field

THE Carnation Company of California, long associated with evaporated milk, is going into the frozen foods business. This announcement was made by Jaxon O. Hice, veteran Georgia packer, of "the largest merger of seafood productive facilities in the history of the food industry." The merger, he explained, will bring more than thirty seafood processors together in a new company, Aqua-foods Corp., with headquarters in Tampa, Fla.

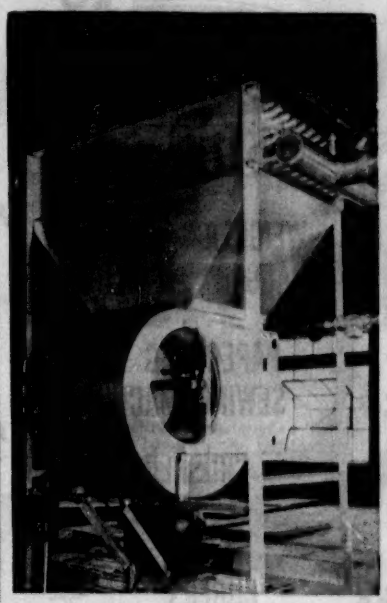
Arrangements have been made to market Aquafood fish products as Carnation Seafoods under the familiar red-and-white Carnation label, Mr. Hice said. Sales next year, he declared, should reach $50,000,000. Mr. Hice is president of Aqua-foods Corp.

New Frozen Food Warehouse

WORK has begun on a new cold storage warehouse at Auburndale, Fla to be known as the Auburndale Freezer Corp., it will have a capacity of 3,000,000 cubic feet and will be affiliated with similar plants at Plymouth and Leesburg. While the new plant will be operated by Minute Maid Corp. in conjunction with that firm's Auburndale plant, W. B. Toler, manager of the Plymouth Freezer Corp., said other frozen food firms will also use it.

The warehouse will be near the Snowcrop plant and will have sidings from the main line of both the Seaboard Air Line and Atlantic Coast Line Railroads. C. H. Pitts, manager of Leesburg Freezer Corp., was quoted as saying the plant is expected to cost about a million dollars.

COMPRESSOR HEAD PRESSURE REDUCED FROM 230 to 120 lbs



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USED EQUIPMENT—wanted & for sale

FOR SALE — Refrigeration equipment; ice equipment; new, used. Advise us your needs. Use "QUICKSEAL" — stops brine tank leaks; easy, efficient, economical. Born Company, 80 East Jackson Boulevard, Chicago 4, Illinois, WAbash 2-5299.

FOR SALE — Ammonia Compressors, 4 x 4, 6 x 6, 7½ x 7½, 8 x 8, 9 x 9, 10 x 10, 9½ x 9½. 75 ton evaporative Niagara condenser; 30 ton York, trunk type coil complete with agitator; ice plant, cans, cranes, agitators, blowers. Parke Pettegrew, 370 West Broad St., Columbus 8, Ohio.

FOR SALE — 1344 feet of FINNED PIPE — 12' lengths. Made from 2" pipe — 7" fins — 1½" apart. All heavily galvanized. NEW at half price. Also 150 steel hand trucks — roller bearing wheels. $6.00 each new. West Side Cold Storage Co. 7 Harrison St., New York 13, N.Y.

FOR SALE

1 — 12"x12" 4 cyl. late Frick compressor.
1 — 11"x13" 2 cyl. York direct conn. syn. motor.
3 — 10"x10" 2 cyl. York direct conn. syn. motor.
2 — 9"x9" — 2 cyl. York direct conn. syn. motor.
1 — 7"x7" — 2 cyl. Frick direct conn. syn. motor.
1 — 7½"x7½" 2 cyl. York V. flywheel comp.
1 — 6"x6" — 2 cyl. Frick flat flywheel comp.
1 — 5"x5" — 2 cyl. Frick V. flywheel compressor.
3 — 9¼"x14" 115 h.p. Wolverine Diesel engine.
1 — 8 ton Niagara Evap. condenser.
11x22x47" and 11x22x51" ice cans.
Ice Plants — 20 to 100 tons.

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Two 4⅛ x 4¼ 6-cyl. Frick "Eclipse" compressors.
Ammonia compressors 4 x 4 to 10 x 10.
100 ton capacity Chester Jensen chilled water unit.
50,000 ft. 1¼" ammonia pipe coils with flanges and return bends 4" centers.
10,000 ft. 2" ammonia pipe coil 20 ft. long with return bends 3½" centers.
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WANTED — Ice cans 11" x 22" x 51" x 52 overall height. Preferable in York 16 groups with three lifting pins. Will buy up to 70 groups. Will also consider single cans. State age and condition. The M. J. Uline Co., 3rd & M St. N.E., Washington 2, D. C.

FOR SALE — one ten ton Frick ice plant, installed new in 1945, complete with following: 7" x 7" compressor with 40 h.p. motor; submerged brine cooler and agitator; 144 can tank complete with deck top and cans; receiver, traps and completely pipe system. I.D. Wood Enfield, N.C.

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USED EQUIPMENT—continued

FOR SALE — All patterns, drawings, jigs and name Bedell Ice Machine Co. 5 sizes. Retiring; reasonable offer accepted. Harley Benedict, 306 Snug Harbor Road, Newport Beach, Calif.

FOR SALE — One 4x4 Frick, 5x5, 8x8, 9x9 Yorks, 10" x 7" Worthington Booster, 5 h.p. Carrier and 15 h.p. Freon York compressors. Write E. Niebling, 1546 St. Clair Ave., Mt. Healthy, Cincinnati 31, Ohio.

FOR SALE — 1 — 8x8 Bedell ammonia compressor, new, $2200.00; 1 — 6½x6½ Bedell ammonia compressor, new, $1,800.00; 1 — 5x5 Bedell ammonia compressor, new, $800.00; 1 — 6½x6½ York, used, with motor $650.00; 2 — 5x5 Arctics, rebored and rebuilt like new, $450.00 each; 1 — No. 999 Van Norman reboring machine $1,000.00; 1 — medium and large Sawyer crankshaft returning machine and all tools, $500.00. Bedell Ice Machine Co. Harley Benedict, 306 Snug Harbor Road, Newport Beach, Calif.

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Rates are shown at the beginning of this section — closing date is the ??? of the month.

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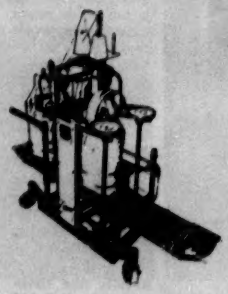

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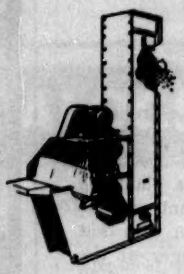

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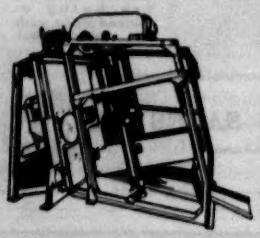

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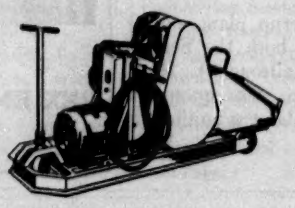

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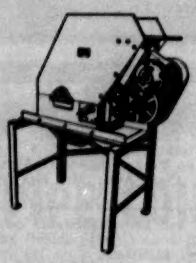

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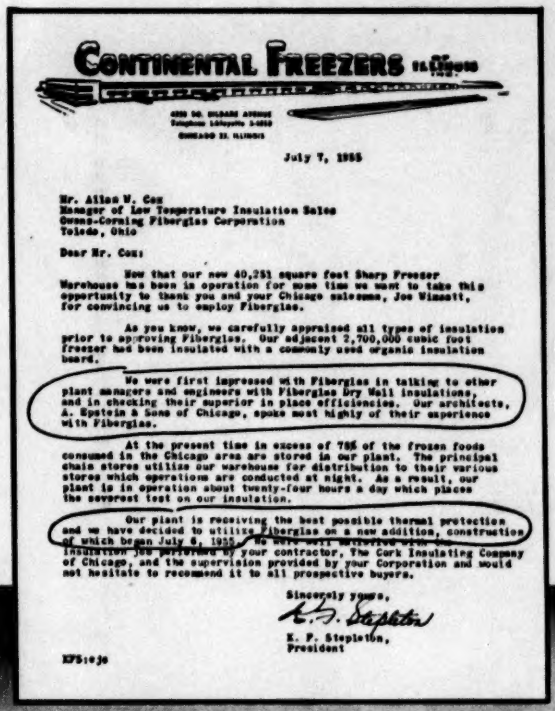


CONTINENTAL FREEZERS INC. OF ILLINOIS

4200 SO. KILDARE AVENUE
Telephone LAfayette 3-4010
CHICAGO 32, ILLINOIS

July 7, 1955

Mr. Allen W. Cox
Manager of Low Temperature Insulation Sales
Owens-Corning Fiberglas Corporation
Toledo, Ohio

Dear Mr. Cox:

Now that our new 40,251 square foot Sharp Freezer Warehouse has been in operation for some time we want to take this opportunity to thank you and your Chicago salesman, Joe Winnett, for convincing us to employ Fiberglas.

As you know, we carefully appraised all types of insulation prior to approving Fiberglas. Our adjacent 2,700,000 cubic foot freezer had been insulated with a commonly used organic insulation board.

We were first impressed with Fiberglas in talking to other plant managers and engineers with Fiberglas Dry Wall insulations, and in checking their superior in place efficiencies. Our architects, A. Epstein & Sons of Chicago, spoke most highly of their experience with Fiberglas.

At the present time in excess of 70% of the frozen foods consumed in the Chicago area are stored in our plant. The principal chain stores utilize our warehouse for distribution to their various stores which operations are conducted at night. As a result, our plant is in operation about twenty-four hours a day which places the severest test on our insulation.

Our plant is receiving the best possible thermal protection and we have decided to utilize Fiberglas on a new addition, construction of which began July 6, 1955. We have every confidence in the installation job performed by your contractor, The Cork Insulating Company of Chicago, and the supervision provided by your Corporation and would not hesitate to recommend it to all prospective buyers.

Sincerely yours,

K. F. Stepleton

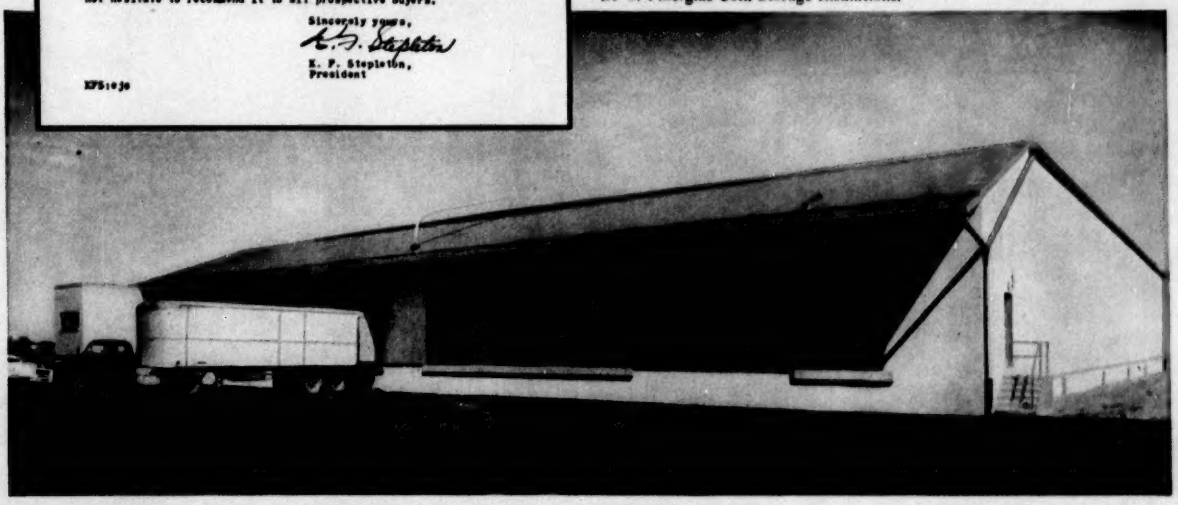
K. F. Stepleton,
President

KFS:ejo

PRESIDENT OF HUGE FREEZER PLANT

appraises all types . . . chooses Fiberglas PF Dry Wall!

NEW SHARP FREEZER WAREHOUSE of Continental Freezers of Illinois, Inc.—latest addition in Continental's expansion program. Capacity . . . 620,000 cu. ft. • Insulation . . . 650,000 BF of Fiberglas Cold Storage Insulations.



When comparisons are made between insulations, it's not surprising that the choice is often Fiberglas* Insulation in dry wall construction. For it offers *three very important* advantages to every operator of a cold storage plant:

- Superior thermal efficiency for low operating costs
- Low installation costs
- Minimum of condensation problems

The above letter from K. F. Stepleton, President of Continental Freezers, points out that results have been so satisfactory under severest conditions that Fiberglas was chosen as the insulation for a *new* addition begun in July, 1955.

In dry wall construction, only one highly efficient warm side vapor barrier is used. The hazards of hot asphalt application are avoided because the boards of Fiberglas Insulation are secured by pressing them into place between treated wood studs. (And the insulation can be removed and reused at any time without damage!)

The interior finish is vapor permeable. Any vapor that does penetrate the barrier continues on its way *through* the insulation. It does not condense within the insulation to lower the efficiency and increase operating costs.

Comparisons *do* lead to Fiberglas Insulations! Get all the facts to make your own comparisons by mailing the coupon below.

FIBERGLAS

*T.M. Reg. Owens-Corning Fiberglas Corporation

Owens-Corning Fiberglas Corporation
Dept. 165-J, Toledo 1, Ohio

Please send me the booklets I have checked.

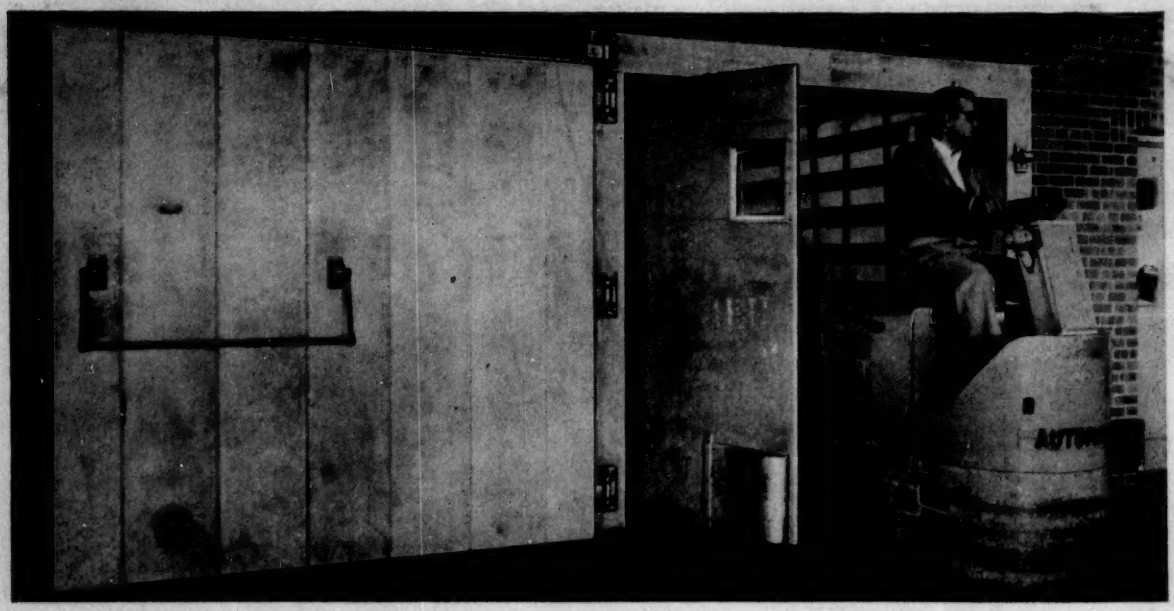
- ☐ "Insulation for Low Temperature Structures and Equipment"
- ☐ "PF Design Details"
- ☐ "Why the Trend is to Fiberglas"

Name and Title_____

Company_____

Street_____

City_____ **Zone**_____ **State**_____

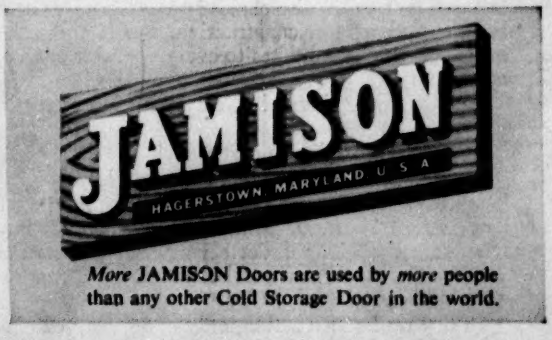


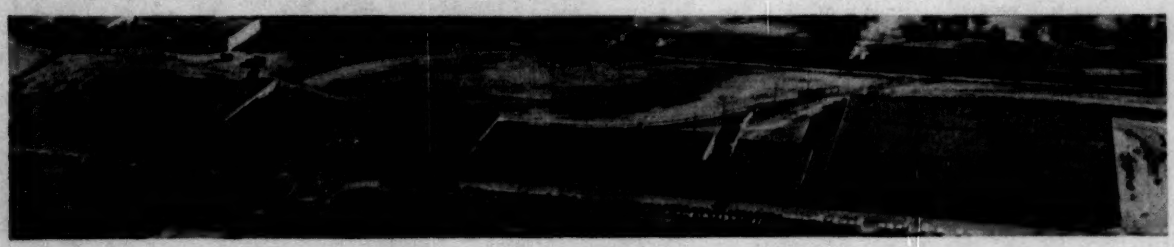
COLD STORAGE DOORS A BIG 8 FEET WIDE give lots of clearance for both trailer type and fork lift trucks. Vestibule doors hold down cold losses. Frames provide rigidity in supporting the doors.

SAFEWAY Keeps Foods on the Go through JAMISON Engineered Doors

At Safeway Stores' mammoth distribution center in Denver, Colorado, most foods aren't really stored . . . they're moved in and hours later, just as quickly moved out. Eighty-seven Jamison Doors help to make this high-speed handling possible. They're engineered to open quickly . . . to speed traffic . . . and to prevent excessive cold losses while doing it.

For additional facts about Jamison Doors, see your architect or write to JAMISON COLD STORAGE DOOR CO., HAGERSTOWN, MD.



More JAMISON Doors are used by *more* people than any other Cold Storage Door in the world.

SAFEWAY STORES' VAST DISTRIBUTION CENTER in Denver efficiently serves 127 of their stores over a four state area.